

## **CHAPTER 3**

# **AFFECTED ENVIRONMENT**

### **PARTNERSHIPS**

Reclamation currently has several partnerships in place at Navajo Reservoir. These include Colorado Division of Parks and Outdoor Recreation (CDPOR), New Mexico State Parks Division, and the Bureau of Land Management (BLM).

Both CDPOR and NMSPD manage recreation and certain other resources at Navajo Reservoir in their respective states in accordance with agreements with Reclamation and applicable federal and state laws and regulations. CDPOR is currently managing Navajo State Park under a 1994 agreement, while NMSPD is managing Navajo Lake State Park under a twice amended 1972 agreement. Reclamation and NMSPD have recently begun negotiations on a new management agreement.

Within the reservoir area in New Mexico, BLM manages federal minerals and livestock grazing in cooperation with Reclamation, and in accordance with applicable laws, regulations, and agreements. Current agreements between the two agencies include a 1983 nation-wide Interagency Agreement, a 1967 agreement for the mineral management and a 1990 agreement for the livestock management. BLM also manages these resources within the reservoir area in accordance with its recently revised RMP and other applicable activity plans. BLM management decisions regarding minerals and livestock grazing within the FFO also apply to Navajo Reservoir area lands in New Mexico. Reclamation, at its discretion and as appropriate, may incorporate other BLM management prescriptions and actions into the Navajo Reservoir RMP.

### **WATER RESOURCES**

#### **Surface Water**

Navajo Dam is located on the San Juan River in New Mexico, about 21 miles east of Bloomfield, New Mexico. The storage capacity of the reservoir is about 1,709,000 acre-feet at the spillway elevation of 6,085 feet. This water elevation results in a reservoir surface area of about 15,600 acres and about 150 miles of shoreline. The “normal operating capacity” for Navajo Reservoir, consists of water surface elevations between 5,990 and 6,085 feet above sea level; a vertical difference of 95 feet (USBR 1999). The reservoir’s maximum high water line is at 6101.5 feet above sea level. Water quality of the reservoir is considered good (USBR 1999).

Three rivers, the San Juan, the Piedra, and the Los Pinos (Pine) rivers, provide the majority of the reservoir’s inflow. These rivers originate along the continental divide in the San Juan Mountains of Colorado about 40 to 50 miles north of the reservoir. Stream flow varies, with peak flows during the spring runoff and a substantial reduction in flow from midsummer through fall (USBR 2003b). The majority of the reservoir inflow from these rivers occurs during the April – July runoff when an average of 666,802 acre-feet enters the reservoir. The water quality of these rivers is considered good (USBR 1999). Additional inflow from storm events is provided by these rivers and the reservoir’s major ephemeral tributaries (e.g. Bancos, La Jara, and Frances) (USBR 1999).

Reservoir water levels fluctuate throughout the year as a result of evaporation, water use, inflow, and reservoir operations (See Map 3-1 which shows the difference in reservoir water surface area between the approximate maximum high water line (6,100 ft.) and the approximate inactive pool elevation (about 6000 ft.)). Reservoir operations release water from the reservoir to meet water use demands and to accommodate anticipated inflows to avoid uncontrolled spills. The highest water level each year is generally reached in June during spring runoff. The lowest water level is generally reached in February and March. Until 1999, the reservoir generally had an average May through October water elevation of 6,060' (about 25' below normal water surface elevation) with a corresponding water surface of about 12,600 acres (USBR 1999). However, due to recent long-term drought conditions, that May-October average water elevation has dropped. The reservoir has the potential to be as low as 5,975 feet in extreme low water years (USBR 2003b).








**Figure 3-1: Arboles (CO) Boat Ramp, April 1983  
(USBR file photo 1983)**

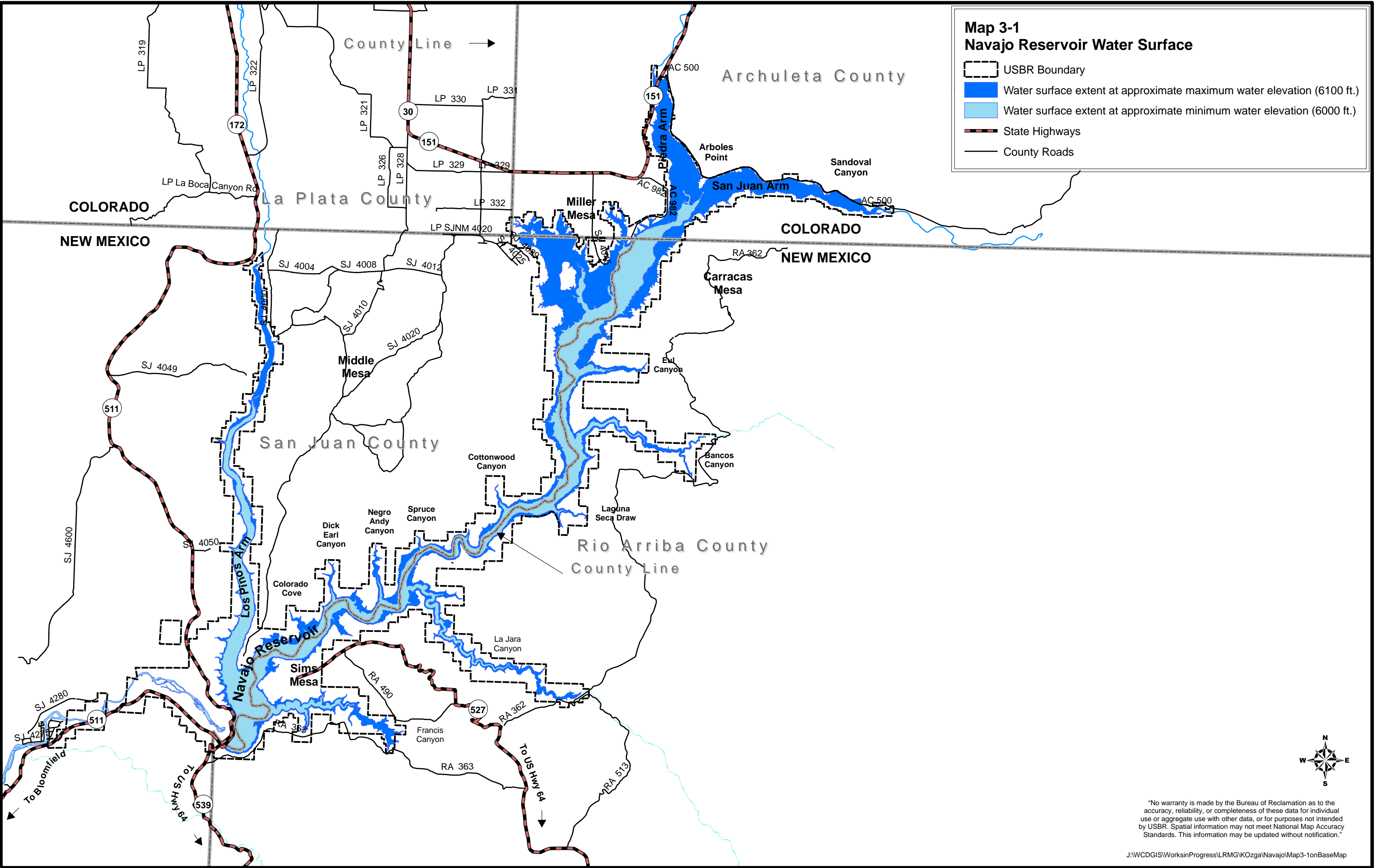


**Figure 3-2: Arboles Boat Ramp- March 12, 2003  
(Photo by John Weiss)**

Below the dam, the San Juan River flows across portions of New Mexico, Colorado and Utah to its confluence with the Colorado River at Lake Powell in Utah. River flows just below the dam are controlled by dam releases which have historically ranged from about 300-500 cubic feet per second (cfs) in the winter to 5,000 cfs in May and June. Dam releases have recently changed due to reservoir operations to meet endangered fish recovery goals with minimum releases of about 250 cfs and maximum controlled releases

**Map 3-1  
Navajo Reservoir Water Surface**

-  USBR Boundary
-  Water surface extent at approximate maximum water elevation (6100 ft.)
-  Water surface extent at approximate minimum water elevation (6000 ft.)
-  State Highways
-  County Roads



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of about 5000 cfs. Additional inflows to the San Juan River below the dam come from the Animas, La Plata, and Mancos Rivers, and major intermittent tributaries. The safe channel capacity is 5,000 cfs below the dam and 12,000 cfs through Farmington.

Water quality in the San Juan River between Navajo Dam and Lake Powell generally continues to decline as one progresses downstream (USBR 2000b). This progressive decline in water quality is due to diversions for agricultural, municipal and industrial use; return flows; bank erosion; and tributary contributions (USBR 2002).

### **Water Allocations/Management**

There are numerous water rights on the reservoir, its tributary rivers and the San Juan River below the dam. These water rights are for beneficial consumptive use of the water. Some rights, such as the Navajo Nation's, are reserved, while others are appropriated. However, not all of the existing water rights have been quantified or maintained. (See Appendix C).

Surface water in the San Juan River Basin, including Navajo Reservoir, is managed through a complex set of federal and state laws and river compacts (USBR 2002). Both Colorado and New Mexico water law is based on the prior appropriation doctrine. Each state supervises and administers the appropriation and use of its water allocation under various river compacts. For a more detailed description of water management associated with Navajo Reservoir, please refer to Reclamation's 2002 DEIS for Navajo Reservoir Operations.

## **NATURAL AND CULTURAL RESOURCES**

### **Air Quality**

The Navajo Reservoir area is presumed to meet National Ambient Air Quality Standards (NAAQS) based on designations for areas around the reservoir. The area north and west of Navajo Reservoir currently meets NAAQS (USBR 2003b). The entire FFO project region currently meets state and national ambient air quality standards and the air resource has not been a substantial constraint to regional development (BLM 2003b). Since 80 percent of the reservoir area is within the FFO planning area and there are no major pollution sources around the reservoir, it is presumed that the whole reservoir area currently meets NAAQS.

Pollutants affecting air quality within the area include, but are not necessarily limited to, volatile organic compounds (VOCs), ozone, carbon monoxide, nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), particulate matter less than 10 microns in diameter (includes fugitive dust), and particulate matter less than 2.5 microns in diameter. Sources of these pollutants in the general area include, but are not limited to:

- Coal-fired power plants in the Four Corners area,
- Oil/gas development and transportation, and
- On and off road vehicles.

However, with the exception of ozone, pollutants levels within the FFO project region generally have not exceeded ambient air quality standards during the 1995 through 2001 monitoring period. Levels of these pollutants, as measured at Farmington and Bloomfield, are generally well below ambient air quality standards. Maximum eight-hour ozone levels, as measured at Shiprock and Bloomfield from 1999 to 2001, indicate

that the project region is near the NAAQS non-attainment standard for that parameter. (BLM 2003a)

The major air pollutant in the vicinity of Navajo Reservoir is particle matter in the form of fugitive dust. The amount of fugitive dust in the area at any given time depends on wind speed, soil exposure, moisture content of soil, and active soil disturbance. Local dust sources include agricultural tilling, vehicle travel on gravel and dirt roads, and bare ground. Fugitive dust can also come from far away, depending on regional weather conditions. (USBR 2003b)

Air pollutant emissions may be subject to various federal, state and local regulations or requirements. The US Environmental Protection Agency and state air quality control agencies set ambient air quality standards and regulate various activities that emit pollutants.

### **Noise**

Sounds and sound levels within the reservoir area are highly variable; they are dependent on the source and the nature of the sound, the location of the receiver in relation to the sound source, and many other factors. Sound levels may be either increased or decreased by such factors as distance from the source; topographic features; vegetation; atmospheric conditions; number and types of sound sources; whether the sound is traveling across water; the sounds' components (pitch, loudness, and time pattern); and an individual's ability to hear.

Noise is usually defined as unwanted sound that disrupts normal activities or that diminishes the quality of the environment. It is usually caused by human activity that adds to the natural acoustic setting of a locale. Various descriptors are used to describe sound and noise levels. These include the A-weighted decibel scale (dBA); sound level equivalents (Leq), day-night average sound levels (Ldn), and percentile levels. The different noise level descriptors cannot be compared directly. See Appendix E for a simplified explanation of sound and noise related information.

Reclamation has not conducted a noise review within the reservoir area. However, the most common noise sources within the reservoir area are highway and road traffic, recreational use and management, and oil and gas development. All of the noises from these sources are typical of the various activities occurring in the area. Common noise levels for various human activities within and adjacent to the reservoir area are shown in Table 3-1.

Traffic noise is never constant and depends on 1) traffic volume, 2) traffic speed, and 3) the number of trucks in the traffic flow. Traffic noise generally increases with heavier volumes of traffic, higher speeds, and greater numbers of trucks. Vehicle noise is a combination of noise produced by the engine, exhaust, and tires, and can be increased by faulty equipment. Traffic noise is considered a linear noise source and is usually described as a single number; most commonly L10 (that sound level which is exceeded 10% of the time) or a Leq. Peak sound levels for freeway traffic at 50 feet may be about 70 dBA, while light auto traffic may be about 53 dBA. Both the L10 and the Leq would generally be less; with the Leq about 3 dB lower than the L10 for the same conditions.

Recreational noise sources include motorized vessels including personal water craft, human voices, trash collection, motorized vehicles, and generator noise. Noise levels and patterns at the developed recreation areas and some of the more frequently and heavily used informal use areas (such as Colorado Cove, Frances Cove, Arboles Point, Miller Mesa), are typical of campground and day use recreation areas. These heavy recreational use areas could be compared to residential areas with an Ldn range of about 50 dBA (quiet suburb, not close to major roads, and little nighttime activity) to about 65 dBA (relatively noisy residential area). Recreation related noise would generally be louder during daylight hours and on weekends, particularly from about May through October.

Outside of the formal and informal recreation areas, the most conspicuous recreational noise producers are power boats and personal water craft (jet skis) on the reservoir. While power boats and jet skis may both have an average sound level of about 90 dBA, how they are operated can change their sound levels. Like vehicles, increased vessel speed increases noise levels. Radical maneuvers (wake jumping, turning doughnuts, etc.) create constantly changing sounds due to engine pitch changes, loss of the muffling effect of water during jumps, and, and the “whump” of the landing after a jump. At 60 mph, a jet ski’s sound level can exceed 115 dBA and during radical maneuvers its sound level may reach 95 dBA. Again, most of this noise would be during daylight hours and on weekends from about May through October.

**Table 3-1: Approximate maximum A-weighted sound levels at 50’<sup>1</sup>**

Activity	Range in dBA	Timing Pattern
Site construction and rehabilitation (earth moving and agricultural equipment)	93 -108	<ul style="list-style-type: none"> <li>▪ Intermittent and fluctuating sound levels during actual operations</li> <li>▪ Typically day operations only</li> </ul>
Oil/gas drilling/workover	100 - 130	<ul style="list-style-type: none"> <li>▪ Intermittent and fluctuating sound levels during operations</li> <li>▪ 24 hour/day operation</li> <li>▪ 1 week to several months duration</li> </ul>
Oil/gas fracturing operation	100 - 145	<ul style="list-style-type: none"> <li>▪ Intermittent and fluctuating sound levels during operations</li> <li>▪ Venting/flaring of gas are loud and continuous, but last only 1-2 days</li> <li>▪ 24 hour/day operation</li> <li>▪ 1 -2 weeks duration</li> </ul>
Oil/gas production	62-87	<ul style="list-style-type: none"> <li>▪ Long term, generally continuous sound levels, though sometimes intermittent</li> <li>▪ 24 hours/day, 7 days/week, year round operations</li> </ul>
Natural gas compressors	65 -90	<ul style="list-style-type: none"> <li>▪ Long term, continuous sound levels</li> <li>▪ 24 hours/day, 7 days/week, year round operations</li> <li>▪ Low pitched sound</li> </ul>
Highway and road traffic	80-100	<ul style="list-style-type: none"> <li>▪ Long term, intermittent and fluctuating sound levels</li> <li>▪ Generally heavier use and noise levels during daylight hours</li> <li>▪ 7 days/week, year-round</li> </ul>
Developed recreational areas (Ldn) (presumed similar to relatively quiet residential areas)	50 - 65	<ul style="list-style-type: none"> <li>▪ Intermittent and fluctuating sound levels.</li> <li>▪ Generally greater activity and noise levels during summer week-ends and daylight hours</li> </ul>

Motor boating (including jet skis)	70 - 115	<ul style="list-style-type: none"> <li>▪ Intermittent and fluctuating sound levels</li> <li>▪ Generally greater activity and noise levels during summer week-ends and daylight hours</li> </ul>
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<sup>1</sup> Sound level ranges were computed from various sound level listings using a 6dB decrease/increase for each doubling/halving of distance from the noise source to approximate the noise level at 50 feet. This is a very simplified description of some typical noise levels that may occur within the reservoir area.

Noise from oil and gas development, and compressors, in particular, has been identified as a major issue for the area. Such noise comes from site construction, drilling, production, transportation, and site rehabilitation activities and the associated equipment (heavy machinery, heavy equipment, vehicles, generators, compressors, etc.) and standard operating procedures (well venting, gas flaring, etc.). Many of these noises are often loud, but vary in duration and timing. Some, like well venting, may occur suddenly and without notice but are of relatively short duration. The noise associated with coalbed methane fracturing operations, including flaring of gas, has been likened to a jet plane taking off. Compressors may emit a more constant and long-term low-pitched humming or rumble that is very pervasive. Various measures such as mufflers, facility design and siting, and natural buffers are used to mitigate some of these noise levels.

An increase in noise levels from multiple sources is not a simple mathematical addition due to the logarithmic nature of the decibel scale. Two noise sources producing equal sound levels at a given location will produce a composite sound level that is about 3 dB greater than either sound alone. When two noise sources differ by 10 dB, the composite noise level will be only 0.4 dB greater than the louder source.

Increased distance from the noise source reduces noise levels. Generally, sound levels from a noise source will decrease by about 6 dB for every doubling of distance away from the noise source over land and about 5 dB over water. For a linear noise source, such as highway traffic, sound levels decrease by about 3 dB for every doubling of distance away from the roadway.

Sound levels may be increased or decreased due to weather, topographic, structural, and vegetative factors between the source and the receiver. Dense vegetation and intervening structural or topographic features can reduce sound levels.

Noise levels adjacent to and within the reservoir area may be subject to various federal, state and local regulations or requirements. Occupational noise levels and the associated hearing protection requirements are regulated by federal and state agencies, such as OSHA, and will not be addressed in this document. The FFO has issued a Notice to Lessee (NTL) for the reduction of oil/gas production and transportation noise from federal oil/gas leases at various receptor points, including recreation areas and the reservoir area boundary, in noise sensitive areas (NSAs). The State of Colorado has laws and regulations for the abatement of noise considered a public nuisance, and noise related to oil and gas development. With the exception of the NMSPD, the State of New Mexico, and San Juan and Rio Arriba counties apparently have no environmental noise limits or abatement requirements which would affect activities around the reservoir. The CDPOR and NMSPD have park rules or regulations that limit noise from recreational equipment and use in certain areas and at certain times of the day. Both La Plata County and Archuleta County have noise abatement requirements for oil and gas activities in their

land use codes. The reader should refer to the respective laws, regulations, and rules for details.

## **Geologic Resources**

### **Landforms**

Most of the Navajo Reservoir area lies within the Navajo Section of the Colorado Plateau Physiographic Province. The Colorado Plateau portion of the area is characterized by horizontal sedimentary rocks carved into broad mesas, buttes, plateaus, valleys and canyons. Many of the reservoir's tributary drainages, such as Frances, Bancos and La Jara, are deeply cut and have straight-walled canyons. The northern portion of the reservoir area is a transitional area between the Colorado Plateau and the Southern Rocky Mountain landscape province. The northern portion of the area is characterized by open, broad, u-shaped valleys bounded by large, steeply sloping mountains and peaks. (USBR 1999)

Elevations within the vicinity of the reservoir area range from about 5,700' near Archuleta, NM, on the San Juan River below the dam, to over 8,500' at Piedra Peak northwest of Arboles, CO. (USBR 1999) Within the reservoir area, elevations range from about 5,700 feet near Archuleta to a maximum of nearly 6,800 feet just southeast of the dam.

### **Geologic Hazards**

Reclamation has documented 14 landslides within the reservoir area. There are four landslides within the Pine Arm, one within the Frances Arm, two near Navajo Dam, two within La Jara Canyon, three between La Jara Canyon and Bancos Canyon, one near Eul Canyon, and one in Colorado on the east side of the reservoir. (USBR 1999)

### **Soils**

In the 1999 preliminary draft EA for this RMP, EDAW interpreted soils information from the USDA Natural Resources Conservation Service as to soil properties and suitability for development activities. It classified the soils around Navajo Reservoir into three general limitation categories:

- Soils with severe limitations
- Soils with moderate limitations
- Soils with minor limitations

Soils with severe and moderate limitations were further categorized by the specific type of limitations. Soils were classified as having severe limitations if they exhibited one or more of the following characteristics: badlands, rock outcrops, perennially wet, or river wash. Soils were classified as having moderate limitations if they exhibited one or more of the following characteristics: shallow depth to bedrock, high shrink-swell, flooding hazard, severe wind erodibility, wetness, or prior use of the area as a borrow area for construction of the dam.

Soils with severe limitations for river wash occur along the San Juan River below the dam and at the upper ends of the Piedra and San Juan arms. Soils with severe limitations due to rock outcrops occur in the vicinity of the confluence of the Pine and San Juan arms of the reservoir and along the Pine River arm and the main San Juan River portions of the reservoir. Small areas of perennially wet soils occur in the Sambrito Creek area.



Soils with moderate limitations cover most of the reservoir area. The great majority of these soils have shallow depth to bedrock. Some soils with high shrink-swell occur in the Sambrito and upper Piedra and upper San Juan areas. All soils with flooding hazard, severe wind erosion susceptibility and old borrow areas occur along the San Juan River below the dam.

Soils with minor limitations occur primarily along the San Juan River near Archuleta; near the existing Pine River Recreation Area; in the middle of Sims Mesa; at Miller Mesa and Arboles; and along the Piedra River arm.

## **Mineral Resources**

### **Locatable Minerals**

Locatable or hardrock minerals that have economic significance are not found in close proximity to the reservoir area. (USBR 1999)

### **Leasable Minerals**

#### *Gas and Oil*

The following is a brief summary of the gas/oil resources in the proximity of the reservoir area. For more detailed descriptions of the gas and oil resources and reasonable foreseeable development in the general area, please refer to the 2002 SUIT Oil/Gas FEIS and the 2003 Farmington Field Office (BLM) RMP FEIS.

The Navajo reservoir area lies within the San Juan Basin, a known geologic structure for oil/gas. The San Juan Basin gas field is the second largest in the United States (USBR 1999) and covers approximately 15,000 to 25,000 square miles (BLM 2003a). Its natural gas reserves are extensive; with coalbed methane in the Fruitland Formation, alone, estimated in excess of 50 trillion cubic feet (USBR 1999).

The Navajo Reservoir area is located near the northeast edge of the San Juan Basin and represents about 0.3 percent of the basin's area. The New Mexico portion of the reservoir area lies within the high oil/gas development area identified by FFO in its 2003 RMP revision (BLM 2003a).

#### *Coal*

San Juan Basin coal-bearing formations include the Dakota Sandstone, Menefee (of the Mesa Verde Group), and the Fruitland Formation. The largest coal resource comes from the Fruitland Formation which is the closest formation to the surface. However the minimum depth of the Fruitland Formation within the general area is approximately 385' below the surface and extraction in the vicinity of Navajo Reservoir is not considered economically feasible. (USBR 1999)

### **Mineral Materials**

Mineral materials are common varieties of minerals, such as sand, gravel, soil, and rock. Within the general area of the reservoir, these materials are prevalent. However, neither their full extent nor their ownership has been determined. Sand and gravel resources generally occur along the rivers and streams and on old alluvial terraces. The current demand for mineral materials in the area is generally met by several private and BLM pits outside of the reservoir area.

## Land Cover/Vegetation

### General

The land cover and vegetation within and adjacent to the reservoir area is a mosaic of plant communities common to the region (See Map 3-2). This mosaic is dynamic due to environmental conditions (e.g., moisture availability, soils, plant succession stages) and natural (i.e., fire, insect, wildlife, etc.) and human (i.e., commercial and residential development, agriculture, and recreation) influences. The predominant plant community is pinyon-juniper woodlands, dominated by pinyon pine and Utah juniper (USBR, 1999). For more details on the general vegetation of the area, please refer to the following recent planning documents and their associated environmental documents:

- 2000 Navajo State Park Recreation Rehabilitation EA
- 2003 FFO (BLM) PRMP and FEIS
- 2003 Navajo Reservoir Operation FEIS
- 2000 SUIF Natural Resource Management Plan Update
- SUIF Oil/Gas Leasing EIS
- 2000 NMSPD General Management Plan.

The Provisional Southwest Landcover Database identifies 18 cover types within the Navajo Reservoir Area (USGS 2004a). Those cover types are shown in Table 3-2 and on Map 3-2. A brief description of these cover types and their associated vegetation follows the table.

Table 3-2: Cover Types, Navajo Reservoir Area<sup>1</sup>

Cover Type	Land Code	Acres	Percent of Reservoir Area
Agriculture	N080	267.48	0.70
Colorado Plateau Mixed Bedrock Canyon and Tableland	S010	71.73	0.19
Colorado Plateau Mixed Low Sagebrush Shrubland	S056	2.45	0.006
Colorado Plateau Pinyon-Juniper Woodland	S039	16,077.74	42.10
Inter-Mountain Basins Big Sagebrush Shrubland	S054	3,257.46	8.53
Inter-Mountain Basins Greasewood Flat	S096	207.04	0.54
Inter-Mountain Basins Mixed Salt Desert Scrub	S065	252.50	0.66
Inter-Mountain Basins Semi-Desert Grassland	S090	262.82	0.69
Inter-Mountain Basins Semi-Desert Shrub Steppe	S079	834.70	2.19
Inter-Mountain Basins Shale Badland	S011	15.30	0.04
North American Arid West Emergent Marsh	S100	28.53	0.07
Open Water	N11	14,935.77	39.11
Rocky Mountain Aspen Forest and Woodland	S023	1.04	0.003
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	S046	282.73	0.74
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	S093	1,564.33	4.10
Rocky Mountain Lower Montane-Foothill Shrubland	S047	14.20	0.04
Rocky Mountain Ponderosa Pine Woodland	S036	1.69	0.004
Southern Rocky Mountain Montane-Subalpine Grassland	S085	11.64	0.29
TOTALS		38,189.15	100.003 <sup>2</sup>

<sup>1</sup> Data from USGS National Gap Analysis Program. 2004. Provisional Digital Land Cover Map for the Southwestern United States. Version 1.0. RS/GIS Laboratory, College of Natural Resources, Utah State University

<sup>2</sup> Percentage totals do not equal 100 percent due to rounding of figures.

This agriculture type includes: 1) areas of perennial grasses, legumes, or grass-legume mixtures planted for livestock grazing or seed or hay crops (pasture/hay vegetation is greater than 20 percent of the total vegetation); and 2) areas used for the production of annual crops (i.e., corn, vegetables, etc.) and perennial woody crops (i.e., orchards and

vineyards) (crop vegetation accounts for greater than 20 percent of total vegetation); and 3) land being actively tilled. Within the reservoir area, this type consists of former pasture or crop land in the Arboles and Sambrito areas and covers less than 1% of the reservoir area.

The Colorado Plateau Mixed Bedrock Canyon and Tableland type consists of barren and sparsely vegetated (generally less than 10% plant cover) landscapes characterized by steep cliff faces, narrow canyons, and open tablelands of predominately sedimentary rocks. Vegetation is characterized by a very open tree canopy or scattered trees and shrubs with a sparse herbaceous layer. Common species include pinyon, ponderosa pine, junipers, mountain mahogany and other short-shrub and herbaceous species, utilizing moisture from cracks and pockets where soil accumulates. This type covers less than 0.2% of the reservoir area.

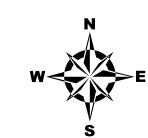
The Colorado Plateau Mixed Low Sagebrush Shrubland type occurs in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 5910 feet (1800 m). Soils are often rocky, shallow, and alkaline. It includes open shrublands and steppe dominated by black sagebrush or Bigelow sagebrush sometimes with Wyoming big sagebrush as a co-dominant. Semi-arid grasses such as Indian ricegrass, 3-awn, blue grama, needle-and-thread, galleta, or muttongrass are often present and may form a grass layer with over 25% cover. This type covers less than 0.01% of the reservoir area.

The Colorado Plateau Pinyon-Juniper Woodland type occurs on warm, dry sites on mountain slopes, mesa, plateaus, and ridges at elevations from 4920 to 8010 feet (1500 - 2440 m). Soils vary in texture from stony, cobbly, gravelly sandy loams to clay loam or clay. Pinyon and/or Utah juniper dominate the tree canopy. In northwestern New Mexico, one-seed juniper and various juniper hybrids may dominate or codominate the tree canopy. Rocky Mountain juniper may codominate or replace Utah juniper at higher elevations. Understory layers are variable and may be absent or may be dominated by shrubs, or grasses. Associated species include greenleaf manzanita, big sagebrush, mountain mahogany, blackbrush, cliffrose, antelope bitterbrush, Gambel oak, blue grama, galleta, or muttongrass. This is the major vegetative type within the reservoir area and covers about 42% of the area. Small stands of ponderosa pine and Douglas fir occur on cool slopes and on the floors of some of the reservoir's canyon tributaries (e.g., La Jara Canyon, Frances Arm, and Bancos Canyon). (USBR 1999)

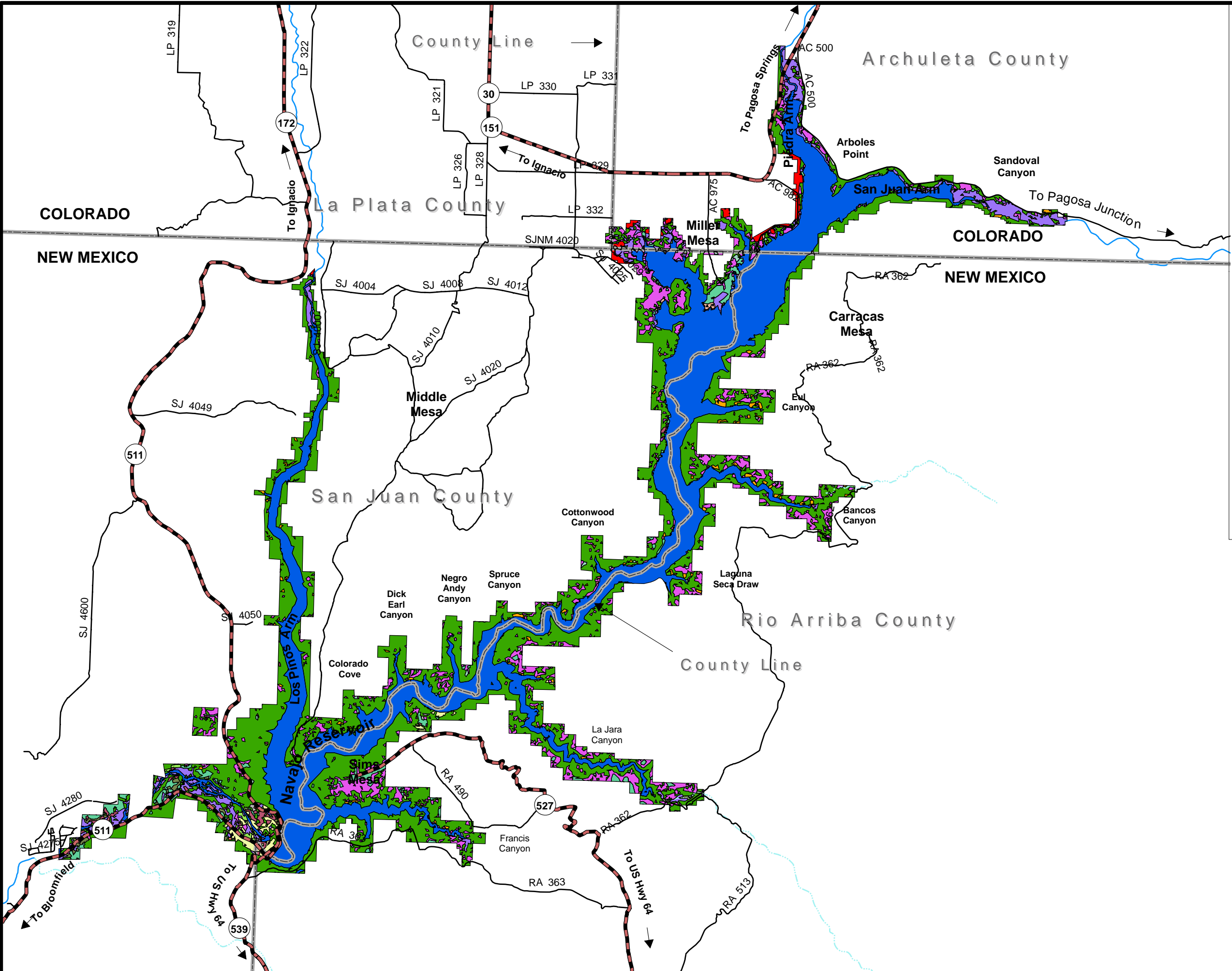
The Inter-Mountain Basins Big Sagebrush Shrubland type occurs in broad basins between mountain ranges, plains, and foothills at elevations from 4920 to 7550 feet (1500 and 2300 m). Soils are typically deep, well-drained and non-saline. They are dominated by basin big sagebrush and/or Wyoming big sagebrush, with scattered junipers, black greasewood, and saltbush present in some stands. Rubber rabbitbrush, Douglas rabbitbrush, antelope bitterbrush, or mountain snowberry may codominate disturbed lands. Perennial herbaceous components typically contribute less than 25% vegetative cover. Common grass species include Indian ricegrass, blue grama, thickspike wheatgrass, Idaho fescue, needle-and-thread, Great Basin wildrye, galleta, western wheatgrass, Sandberg bluegrass, or bluebunch wheatgrass. This type is scattered throughout the reservoir area and covers about 8.5% of it.

**Map 3-2**  
**Land Cover/Vegetation**  
**Navajo Reservoir Area**

- Agriculture
- Colorado Plateau Mixed Bedrock Canyon and Tableland
- Colorado Plateau Mixed Low Sagebrush Shrubland
- Colorado Plateau Pinyon-Juniper Woodland
- Inter-Mountain Basins Big Sagebrush Shrubland
- Inter-Mountain Basins Greasewood Flat
- Inter-Mountain Basins Mixed Salt Desert Scrub
- Inter-Mountain Basins Semi-Desert Grassland
- Inter-Mountain Basins Semi-Desert Shrub Steppe
- Inter-Mountain Basins Shale Badland
- North American Arid West Emergent Marsh
- Open Water
- Rocky Mountain Aspen Forest and Woodland
- Rocky Mountain Gambel Oak-Mixed Montane Shrubland
- Rocky Mountain Lower Montane Riparian Woodland and Shrubland
- Rocky Mountain Lower Montane-Foothill Shrubland
- Rocky Mountain Ponderosa Pine Woodland
- Southern Rocky Mountain Montane-Subalpine Grassland
- State Highways
- County Roads



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The Inter-Mountain Basins Greasewood Flat type occurs near drainages on stream terraces and flats. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This type usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or co-dominated by black greasewood. Four-wing saltbush, shadscale, or winterfat may be present to codominate. Occurrences of this type are often surrounded by mixed salt desert scrub. The herbaceous layer, if present, is usually dominated by grasses. There may be inclusions of alkali sacaton, inland saltgrass, or common spike-rush herbaceous types. Within the reservoir area this type appears most frequently along the San Juan River below the dam but covers less than 1% of the reservoir area.

The Inter-Mountain Basins Mixed Salt Desert Scrub type includes open-canopied shrublands of typically saline basins, alluvial slopes and plains. Substrates are often saline calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils. The vegetation is characterized by an open to moderately dense shrubland of one or more saltbush species such as shadscale, 4-wing saltbush, alkali saltbush, or spinescale saltbush. Other shrubs present to codominate may include Wyoming big sagebrush, Douglas rabbitbrush, rubber rabbitbrush, Nevada Mormon tea, spiny hop-sage, winterfat, desert thorns, or bud sages. Black greasewood is generally absent, but if present, does not codominate. The herbaceous layer varies from sparse to moderately dense and is dominated by perennial grasses such as Indian ricegrass, blue grama, thickspike wheatgrass, western wheatgrass, galleta, big galleta, Sandberg bluegrass, or alkali sacaton. Various forbs are also present. This type covers less than 1% of the reservoir area, with the majority of its occurrences located just below the dam, plus several smaller scattered patches between the Frances and La Jara arms of the reservoir.

The Inter-Mountain Basins Semi-Desert Grassland type occurs on dry plains and mesas, at elevations from about 4750 to 7610 feet (1450 to 2320 m). They occur in typically xeric sites in lowland and upland areas and may occupy swales, playas, mesa tops, plateau parks, alluvial flats, and plains. Substrates are quite variable; they typically include well-drained sand or loamy textured soils derived from sedimentary parent materials, but may also include fine-textured soils derived from igneous and metamorphic rocks. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant. These grasslands are typically dominated or co-dominated by Indian ricegrass, 3-awn, blue grama, needle-and-thread, muhly, or galleta. They may also have scattered shrubs and dwarf-shrubs such as sagebrush, saltbush, blackbrush, Mormon tea, snakeweed, or winterfat. Within the reservoir area this type is mostly located along the San Juan River below the dam scattered throughout the reservoir area and covers less than 1% of it.

The Inter-Mountain Basins Semi-Desert Shrub-Steppe type occurs at lower elevations from about 980 to 8200 feet (300-2500 m) on alluvial fans and flats with moderate to deep soils and is typically dominated by grasses (>25% cover) with an open shrub layer. Characteristic grasses include Indian ricegrass, blue grama, inland saltgrass, needle-and-thread, galleta, Sandberg bluegrass, and alkali sacaton. The woody layer is often a mixture of shrubs and dwarf-shrubs that include 4-wing saltbush, big sagebrush, Greene's rabbitbrush, Douglas rabbitbrush, Mormon tea, rubber rabbitbrush, broom snakeweed, and winterfat. Big sagebrush may be present but does not dominate. Occurrences may be

either open shrubland with patchy grasses or a patchy open herbaceous layer. Disturbance may be important in maintaining the woody component. Microphytic crust is very important in some stands. This type covers about 2% of the reservoir area and is scattered throughout with the largest occurrences along the San Juan River below the dam, on Sims Mesa and on Miller Mesa.

The Inter-Mountain Basins Shale Badland type consists of barren and sparsely vegetated (<10 percent plant cover) clayey substrates typically derived from marine shales but also from siltstones and mudstones. Landforms are typically rounded hills and plains that form a rolling topography. The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse dwarf-shrubs such as mat saltbush, Gardner's saltbush, birdfoot sagebrush), plus herbaceous vegetation. This type covers less than 0.1% of the reservoir area.

The North American Arid West Emergent Marsh type may occur in landscape depressions (ponds, kettles ponds), as fringes around lakes and along slow-flowing streams and rivers. Marshes are frequently or continually inundated, with water depths up to 6.6 feet (2 m). Water levels may be stable, or may fluctuate 3.3 feet (1 m) or more over the course of the growing season. Water chemistry may include alkaline or semi-alkaline situations, but the alkalinity is highly variable even within the same complex of wetlands. Soils are typically mineral, but can accumulate organic material and have characteristics resulting from long periods of anaerobic conditions. The vegetation is characterized by herbaceous plants adapted to saturated soil conditions. Common emergent and floating vegetation includes species of bulrushes, cattails, rushes, pondweeds, smartweeds, yellow water-lilies, and canary grass. This system may also include areas of relatively deep water with floating-leaved plants (duckweed, pondweed, and watershield) and submergent and floating plants (water mil-foils, coontails, and waterweeds). This type covers less than 0.1% of the reservoir area and occurs mostly along the San Juan River below the dam and in the Sambrito Cove and Miller Mesa areas.

The Open Water type consists of areas of open water, generally with less than 25% cover of vegetation or soil. Within the reservoir area this type includes the reservoir and river channels and covers about 40% of the area.

The Rocky Mountain Aspen Forest and Woodland type occurs in the montane and subalpine zones at elevations from 5000-10,000 feet (1525 to 3050 m), but may occur at lower elevations. Its distribution is limited by adequate soil moisture to meet its high evapo-transpiration demand, and by the length of the growing season or low temperatures. These are upland forests and woodlands dominated by quaking aspen without a significant conifer component (< 25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple, with just an herbaceous layer. The herbaceous layer may be dense or sparse, and dominated by grasses or forbs. Associated shrub species include snowberry, thimbleberry, serviceberry, and kinnikinnik. Occurrences of this system originate and are maintained by stand replacing disturbances such as avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver, within the matrix of conifer forests. This type covers less than 0.003% of the reservoir area.

The Rocky Mountain Gambel Oak-Mixed Montane Shrubland type is commonly found along dry foothills, and lower mountain slopes from about 6560 to 9510 feet (2000 to 2900 m) in elevation, and are often situated above pinyon-juniper woodlands. Substrates are variable and include soil types from calcareous, heavy, fine-grained loams to sandy loams, gravelly loams, clay loams, deep alluvial sand, or coarse gravel. The vegetation is typically dominated by Gambel oak, alone, or codominant with serviceberry, big sagebrush, mountain mahogany, chokecherry, Stansbury cliffrose, antelope bitterbrush, New Mexico locust, or snowberry. There may be inclusions of other mesic montane shrublands with Gambel oak absent or as a relatively minor component. This type intergrades with the lower montane-foothills shrubland system and shares many of the same site characteristics. Density and cover of Gambel oak and serviceberry often increase after fire. Small patches of this type are scattered throughout the reservoir area and cover less than 1% of the reservoir area.

The Rocky Mountain Lower Montane Riparian Woodland and Shrubland type often occurs as a mosaic of multiple tree-dominated communities with a diverse shrub component within an elevational range from about 2950 to 9190 feet (900 to 2800 m). Type occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. They can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. Dominant trees may include Box elder, narrowleaf cottonwood, balsam cottonwood, plains cottonwood, Fremont cottonwood, Douglas-fir, blue spruce, peachleaf willow, or Rocky Mountain juniper. Dominant shrubs include Rocky Mountain maple, speckled alder, water birch, red-osier dogwood, river hawthorne, desert olive, chokecherry, skunkbush sumac, park willow, Drummond's willow, coyote willow, bluestem willow, shining willow, silver buffaloberry, or snowberry. Russian olive and tamarisk are common in some stands. Within the reservoir area this type is found mostly along the rivers and in the upper reaches of the reservoir arms and covers about 4% of the reservoir area.

The Rocky Mountain Lower Montane-Foothill Shrubland type occurs from about 4920 to 9510 feet (1500-2900 m) in elevation, and is usually associated with exposed sites, rocky substrates, and dry conditions. This system is generally drier than Rocky Mountain Gambel Oak-Mixed Montane Shrubland, but may include mesic montane shrublands where Gambel oak does not occur. Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically dominated by a variety of shrubs including Utah serviceberry, true mountain mahogany, antelope bitterbrush, skunkbush sumac, wax currant, mountain snowberry, or soapweed yucca. Grasses include various species of muhly, grama, needle-and-thread, and bluebunch wheatgrass. Fires play an important role in this system as the dominant shrubs usually have a severe die-back although some plants will stump sprout. Fire suppression may have allowed an invasion of trees into some of these shrublands, but in many cases sites are too xeric for tree growth. This type is scattered throughout the reservoir area but covers less than 0.1% of it.

The Rocky Mountain Ponderosa Pine Woodland occurs on warm, dry, exposed sites at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests. Elevations range from 6500 feet to 9200 feet (1980 to 2800 m). Occurrences are

most common on moderately steep to very steep slopes or ridgetops, but may be found on all slopes and aspects. This type generally occurs on igneous, metamorphic, and sedimentary material derived soils, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acid pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. Ponderosa pine is the predominant conifer; Douglas-fir, pinyon, and various species of junipers may be present in the tree canopy. The understory is usually shrubby, with black sagebrush, big sagebrush, greenleaf manzanita, kinnikinnick, true mountain mahogany, Stansbury cliffrose, antelope bitterbrush, Gambel oak, mountain snowberry, chokecherry, serviceberry, and wild roses. Bluebunch wheatgrass, and species of needle-and-thread, rice grass, fescue, muhly, and grama are some of the common grasses. Mixed fire regimes and ground fires of variable return intervals maintain these woodlands, depending on climate, degree of soil development, and understory density. This type covers less than 0.01% of the reservoir area.

The Southern Rocky Mountain Montane-Subalpine Grassland type occurs between 7220 and 9840 feet (2200 and 3000 m) on flat to rolling plains and parks or on lower sideslopes that are dry. Soils have a dark brown A-horizon, are relatively high in organic matter, slightly acid, and usually well-drained. An occurrence usually consists of a mosaic of two or three plant associations with one of the following dominant bunch grasses: timber oatgrass, Parry's oatgrass, Idaho fescues, Arizona fescue, Thurber fescue, slimstem muhly, or bluebunch wheatgrass. The subdominants include mountain muhly, blue grama, and Sandberg bluegrass. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, ponderosa pine, and aspen forests. Small occurrences of this type are scattered throughout the reservoir area but cover less than 0.3% of the area.

### **Riparian and Wetland Areas**

Riparian and wetland areas are generally associated with the presence of water for a major portion of the year. They include the reservoir perimeter, perennial and intermittent streams, seeps and springs, and irrigation facilities. Vegetative communities associated with the riparian and wetland areas include cottonwood/willow, and wet meadow.



**Figure 3-3: Riparian Area, Pine River Wetland Mitigation Site (NM); Photo from Steve Mueller 2004.**



**Table 3-3: Riparian and Wetland Areas, Navajo Reservoir Area**

<b>Area</b>	<b>Vegetation</b>	<b>Condition</b>	<b>Comments</b>
Piedra/San Juan arms	<ul style="list-style-type: none"> <li>Sandbar willow is a major component</li> <li>Multi-aged and young sapling cottonwoods are present.</li> </ul>	<ul style="list-style-type: none"> <li>Poor to excellent</li> </ul>	<ul style="list-style-type: none"> <li>Condition dependent on the level of livestock grazing and human access.</li> <li>Cottonwoods successfully reproducing (USBR 1999).</li> <li>Some of the most important wetland and riparian communities in the reservoir area.</li> </ul>
Arboles (including west side of Piedra arm)	<ul style="list-style-type: none"> <li>Cottonwood and willow communities occur in patches in riparian areas and along the reservoir high water line.</li> <li>Cattails, sedges and rushes occur in the isolated wetlands.</li> </ul>	<ul style="list-style-type: none"> <li>Not assessed, though the cottonwood and willow communities appear to be in fair to good condition.</li> </ul>	<ul style="list-style-type: none"> <li>Along the reservoir perimeter, where slopes are gentler, isolated wetlands occur in coves, and riparian areas parallel some of the shoreline.</li> </ul>
San Juan River (below dam)	<ul style="list-style-type: none"> <li>A number of large mature cottonwood trees present; little regeneration evident.</li> <li>Riparian vegetation is dominated by willows and cottonwoods, with scattered patches of cattails, sedges, and rushes</li> <li>Scattered tamarisk and Russian olive occurs. (USBR 1999)</li> </ul>	<ul style="list-style-type: none"> <li>Poor to good</li> </ul>	<ul style="list-style-type: none"> <li>Human presence along river is high.</li> <li>Lack of over bank flooding is contributing to the lack of cottonwood regeneration. (USBR 1999)</li> </ul>
Upper Los Pinos arm	<ul style="list-style-type: none"> <li>Dominant cottonwoods and willow with poor-condition understory (USBR 1999).</li> <li>Between 2001 and 2004, about 36 acres were revegetated with native and introduced species, including grasses, willows and narrow-leaf cottonwood.</li> </ul>	<ul style="list-style-type: none"> <li>Poor to Fair</li> </ul>	<ul style="list-style-type: none"> <li>Minimal cottonwood regeneration present at the reservoir inlet; poor-condition understory (USBR 1999).</li> <li>Pine River wetlands mitigation site: 36 acres of riparian habitat along the river was recently enhanced.</li> <li>Current vegetative conditions due, in part, to unauthorized livestock grazing.</li> </ul>
Reservoir drawdown zone	<ul style="list-style-type: none"> <li>Young cottonwoods and willows along high-water line</li> <li>Native vegetation includes sandbar willow, spike-rush, and sedges.</li> <li>Introduced vegetation includes tamarisk, cheatgrass, mullin, and whitetop.</li> </ul>	<ul style="list-style-type: none"> <li>Not assessed</li> </ul>	<ul style="list-style-type: none"> <li>Vegetation and its condition is subject to seasonal fluctuation of the reservoir.</li> </ul>

Area	Vegetation	Condition	Comments
Sambrito Wetlands	<ul style="list-style-type: none"> <li>Willows, rushes, cattails</li> <li>No overstory</li> </ul>	<ul style="list-style-type: none"> <li>Fair to good</li> </ul>	<ul style="list-style-type: none"> <li>Area managed for wetlands, wildlife, and environmental education.</li> </ul>

### Sensitive Plant Species

Several sensitive plant species that may be present within the reservoir area or may be potentially affected by the implementation of the RMP were identified by the US Fish and Wildlife Service (FWS 1998, FWS 1999b) the Colorado (USBR 1999) and New Mexico Natural Heritage Programs (USBR 1999). Table 3-4 lists those species and provides a summary of these plant species, their current status, habitat requirements, and known or potential occurrence near Navajo Reservoir. Reclamation or its partners have only conducted limited surveys for these species within the reservoir area, so unknown populations of these plants may be present.

**Table 3-4: Sensitive Plant Species Potentially Occurring At Navajo Reservoir**

Name	Status <sup>1</sup>	Occurrence	Habitat Requirements
Abajo penstemon ( <i>Penstemon lentus</i> )	FS CS2	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Possible, due to historic distribution; but low probability.</li> <li>Species largely confined to Navajo Indian Reservation in McKinley County, NM (BLM 1995)</li> <li>Old record (1899) in CNH data base for Arboles, CO (USBR 1999)</li> </ul> <p><b>Reservoir Area:</b></p> <ul style="list-style-type: none"> <li>Possible, but low probability.</li> <li>No populations currently known; no inventories conducted.</li> </ul>	<ul style="list-style-type: none"> <li>In sagebrush, pinyon-juniper, Gambel oak and ponderosa pine communities</li> <li>At elevations of 4,500 to 7,500 feet. (Spackman et al. 1997, NMRPTC 1999).</li> </ul>
Arboles milkvetch ( <i>Astragalus oocalycis</i> )	FS CS3 NMS	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Occurs within SJR drainage in both CO and NM.</li> <li>Three known populations close to the reservoir : <ul style="list-style-type: none"> <li>In the vicinity of Arboles, CO.</li> <li>Near Los Pinos River inlet to reservoir.</li> <li>Along San Juan arm.</li> </ul> </li> </ul> <p>(USBR 1999)</p> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>May occur, but no currently known populations; no inventories conducted.</li> <li>Potential habitat in CO, particularly west side road cuts and landslides on the east side (USBR 2000a).</li> </ul>	<ul style="list-style-type: none"> <li>On thick, seleniferous, clay soils in sagebrush flats, at elevations of 5,600 to 7,000 feet (Spackman et al. 1997; Ecosphere 1995).</li> <li>Often on roadsides, road cuts and in other disturbed areas (NMRPTC 1999).</li> </ul>
Aztec milkvetch ( <i>Astragalus proximus</i> )	FS CS2	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>High probability within its typical habitat. (USBR 1999)</li> </ul> <p><b>Reservoir Area:</b></p> <ul style="list-style-type: none"> <li>Not likely to occur; reservoir area soils are derived from the San Jose formation.</li> </ul>	<ul style="list-style-type: none"> <li>On bluffs, mesas, and low hills in sandy, often alkaline clay soils derived from Lewis or Mancos Shale; among junipers or occasionally sagebrush; at elevations of 5,400 to 7,300 feet. (Spackman, et. al. 1997).</li> </ul>

Name	Status <sup>1</sup>	Occurrence	Habitat Requirements
Knowlton cactus ( <i>Pediocactus knowltonii</i> )	FE CS1 NME	<b>General Area</b> <ul style="list-style-type: none"> <li>Three known populations; all protected.</li> <li>Potential habitat present.</li> </ul> <b>Reservoir Area:</b> <ul style="list-style-type: none"> <li>One recovery population; protected.</li> <li>Poor to excellent potential habitat present (USBR 2000).</li> <li>No <i>P. knowltonii</i> plants/populations found during surveys for the CO Recreation Rehabilitation program (USBR 2000).</li> </ul>	<ul style="list-style-type: none"> <li>Rolling, gravelly hills of alluvial deposits in pinyon-juniper and sagebrush</li> <li>Elevations around 6,200- 6,400 feet. (Spackman, et al. 1997; Ecosphere 1995; NMRPTC 1999).</li> </ul>
Parish's alkali grass ( <i>Puccinellia parishii</i> )	FS CS1 NME	<b>General Area</b> <ul style="list-style-type: none"> <li>May occur; is within the species' general range; habitat requirements are likely present.</li> </ul> <b>Reservoir Area:</b> <ul style="list-style-type: none"> <li>May occur; no surveys conducted.</li> </ul>	<ul style="list-style-type: none"> <li>Alkaline springs, seeps, and seasonally wet areas at the heads of drainages or on gentle slopes, at elevations of 2,600 to 7,350 feet.</li> <li>Requires continuously damp soils during its late winter to spring growing period.</li> <li>Frequently grows with salt grass, alkali sacaton, sedges, bulrushes, rushes, spike rushes, and yerba mansa. (NMRPTC 1999)</li> </ul>
Ripley milkvetch ( <i>Astragalus ripleyi</i> )	FS CS2	<b>General Area</b> <ul style="list-style-type: none"> <li>Occurs in eastern Rio Arriba County, NM and adjacent Conejos County, CO.</li> <li>Not likely to occur in close proximity to the reservoir; habitat requirements not present there.</li> </ul> <b>Reservoir Area:</b> <ul style="list-style-type: none"> <li>Not likely to occur (see above).</li> </ul>	<ul style="list-style-type: none"> <li>Sagebrush, pinyon-juniper woodland, and gambel oak thickets in ponderosa pine forest at elevations from 7,000 to 8,250 feet. (NMRPTC 1999)</li> <li>Volcanic substrates in open canopy ponderosa pine-Arizona fescue savannah, or along edges of mixed coniferous woodlands where Arizona fescue is dominant; elevations from 8,200 to 9,300 feet. (Spackman, et al. 1997)</li> </ul>
Santa Fe cholla ( <i>Opuntia viridiflora</i> )	FS NMS	<b>General Area</b> <ul style="list-style-type: none"> <li>Unlikely; this species is known from only two areas in Santa Fe County, NM (NMRPTC 1999).</li> </ul> <b>Reservoir Area:</b> <ul style="list-style-type: none"> <li>Unlikely (see above).</li> </ul>	<ul style="list-style-type: none"> <li>Gravelly rolling hills in pinyon-juniper woodlands.</li> <li>Elevations between 5,800 and 7,200 feet. (NMRPTC 1999)</li> </ul>

<sup>1</sup> Federal status:

**FE:** Endangered- A species in danger of extinction throughout all or a portion of its range.

**FS:** Sensitive- species designated as a sensitive species or a species of concern by one or more federal agencies, including the USFWS.

Colorado status:

**CS1:** Critically imperiled in Colorado because of extreme rarity; 5 or fewer occurrences, or very few remaining individuals, or because of some factor of its biology making it especially vulnerable to extirpation from the state.

**CS2:** Imperiled in state because of rarity; usually between 6 and 20 populations or occurrences within Colorado; or because of other factors demonstrably making it very vulnerable to extirpation from the state.

**CS3:** Vulnerable in Colorado; usually between 21 and 100 populations or occurrences.

New Mexico status:

**NME:** Endangered- any plant species or subspecies whose prospects of survival or recruitment within New Mexico are in jeopardy or are likely, within the foreseeable future, to become jeopardized.

**NMS:** Sensitive- plant taxa considered to be rare because of restricted distribution or low numerical density within New Mexico.

## Invasive Species and Pests

### Invasive Plants/Noxious Weeds

Several species of invasive plants and noxious weeds may be found throughout the reservoir area and adjoining lands, particularly on areas where soils have been disturbed or exposed, including the reservoir basin drawdown zone. Reclamation has not conducted any inventories for invasive plants on the reservoir area. However, their general presence in the area is known and populations are documented as they are found. CDPOR is in the process of mapping invasive and noxious weeds at Navajo State Park; field work was completed in August, 2004, and the map should be completed in a few months. Refer to Appendix F for a summary of noxious weed occurrences.

There are federal, state, and local requirements for weed control. Executive Order 13112 requires federal agencies to detect and control invasive species, including noxious weeds. Both New Mexico and Colorado have noxious weed management laws which require landowners to control the spread of noxious weeds. La Plata and Archuleta counties each have a weed management program with target weed lists. The Colorado State Parks and New Mexico State Parks offices at Navajo Reservoir currently treat noxious weeds in an effort to control infestations within the developed recreation areas. Both BLM and USBR require permit holders to help control noxious weed infestations within their areas of operations.

### Non-Plant Invasive Species and Pests

Both native and alien, non-plant organisms may be considered pests and/or invasive species depending on the circumstances. Some common species known to or likely to be found within the reservoir area and which, under certain circumstances, may be considered pests include, but are not necessarily limited to: beaver, muskrats, prairie dogs, skunks, deer mice, Canadian geese, flickers, wasps, bees, various forest insects, etc. However, some of these species, under certain other circumstances, may also be considered beneficial. Therefore, for this document we will focus on some organisms that are of special concern because of their potential adverse effects, even though they may not yet be found within the reservoir area.

Non-plant pests and/or invasive species of special concern for the Navajo Reservoir area include, but are not necessarily limited to, those listed in Table 3-5. These species could cause economic or environmental harm, if they should become established in the reservoir area.

Table 3-5: Non-Plant Invasive Species of Concern, Navajo Reservoir Area

Species	Presence in Reservoir Area	Possible Effects	Comments
Zebra Mussel ( <i>Dreissena polymorpha</i> )	Unknown, but presumed not yet present.	<ul style="list-style-type: none"> <li>▪ Clogging of water pipes and control structures.</li> <li>▪ Damage to vessels (including PWCs) and their drive and steering systems</li> <li>▪ Loss of very small aquatic species in the food chain.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential for ready transfer via vessels from populations at other popular boating water bodies east of the 100<sup>th</sup> Meridian</li> <li>▪ Control efforts should include:               <ul style="list-style-type: none"> <li>▪ Public education and information campaign to limit their spread.</li> <li>▪ Periodic monitoring for their presence.</li> <li>▪ Implement prompt control actions if they're discovered</li> </ul> </li> </ul>

New Zealand Mud Snails ( <i>Potamopyrgus antipodarum</i> )	Unknown, but presumed not yet present.	<ul style="list-style-type: none"> <li>▪ Loss of native macroinvertebrates in streams</li> <li>▪ Decline and/or loss of trout fishery</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential for ready transfer from populations at other popular below dam trout fisheries such as Glen Canyon and Flaming Gorge.</li> <li>▪ Control efforts should include: <ul style="list-style-type: none"> <li>▪ Public education and information campaign to limit their spread.</li> <li>▪ Periodic monitoring for their presence.</li> <li>▪ Implement prompt control actions if they're discovered.</li> </ul> </li> </ul>
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Some efforts to control non-plant pests and/or invasive species, both common and those of special concern, or to manage their effects are ongoing within the reservoir area. Such efforts include, but are not limited to:

- Case-by-case resolution of pest situations, particularly common pests in developed areas.
- Public education and information programs.

### Wildlife Habitat

The area's wildlife habitat corresponds to the ecosystems and plant communities present. Each plant community provides various wildlife needs (e.g., thermal and escape cover, forage, travel routes, etc.). The effectiveness of the plant communities in meeting wildlife needs depends on several factors, including:

- wildlife species and their specific needs
- the plant community's vegetative composition, continuity, and condition,
- the relation of one plant community to another
- the amount of fragmentation within the environment

Riparian and wetland communities, though limited in extent, provide highly valuable and productive habitat for both resident and migratory wildlife species. These communities, particularly those with a multi-story canopy, available water, and emergent vegetation, support a greater diversity and density of wildlife species than other habitat types in the area. (USBR, 1999)

### Special/Designated Wildlife Habitat

Several areas around the reservoir have been designated as special habitat or wildlife management areas (See Map 3-3 and Table 3-9). These designations include:

- General
  - Four BLM wildlife management areas (Middle Mesa , Rattlesnake Canyon , Rosa Mesa , Carracas Mesa) each with specific management goals and actions (BLM 2003a)
  - Sambrito Creek Wildlife Area (CO)- approximately 520 acres; much of it in wetlands fed by irrigation water return flows (USBR 1999).
- Bald Eagle (also, see sensitive wildlife species section)
  - BLM has designated a 37-unit bald eagle ACEC around the reservoir in New Mexico (USBR 1999, BLM 2003a).
  - Colorado- CDOW has designated eagle winter range along the Piedra, San Juan, and Los Pinos Rivers (USBR 1999) and winter concentration areas along the Piedra, San Juan, and Los Pinos Arms south to the reservoir and its surrounding areas (USBR 1999).

- In New Mexico there are also small winter concentration areas for eagles along the San Juan River below the dam, and in Eul Canyon (USBR 1999)
- Mule deer
  - Winter/severe winter range- reservoir area and adjoining lands. (USBR 1999, BLM 2003a )
  - Fawning area- along the southwestern portion of the reservoir. (USBR 1999)
- Elk
  - Primary migration corridor- south of Tiffany, Colorado, along the reservoir (USBR 1999)
  - Severe winter range- reservoir area and adjoining lands. (USBR 1999)
  - Calving areas- along the eastern portion of Middle Mesa; high elk use occurs in both Spruce and Cottonwood Canyons (USBR 1999).

## Wildlife

### General

The wildlife within and around the reservoir area is representative of the region and the ecosystems present. Species present include a wide variety of mammals, birds, reptiles, amphibians, fish, and insects. Many of the species are widely distributed and occupy a variety of habitat types, while others may only occur in localized areas or very highly defined habitats. For a more detailed listing of area wildlife, please refer to the following recent planning documents and their associated environmental documents:

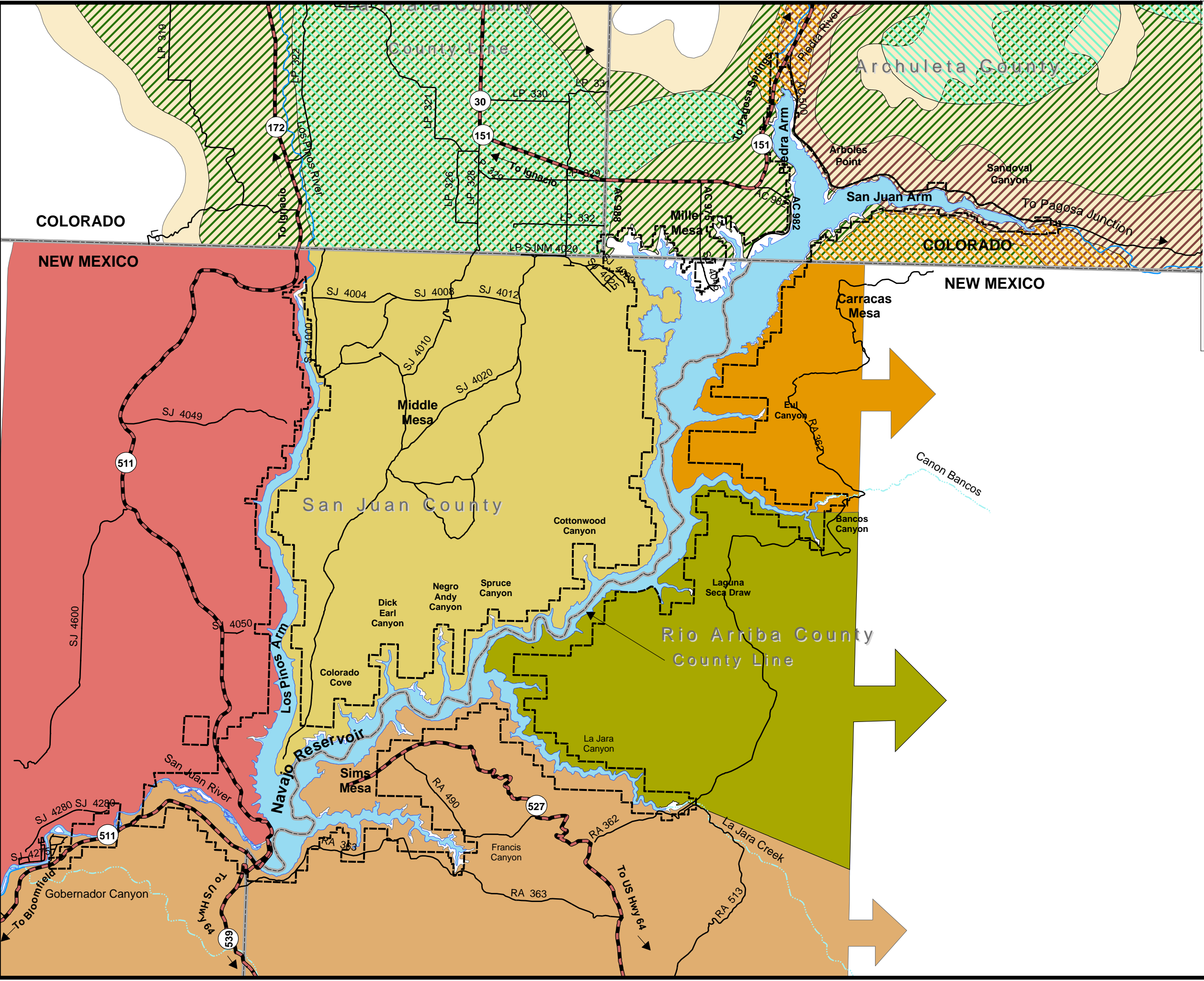
- 2003 FFO (BLM) PRMP and FEIS
- 2003 Navajo Reservoir Operation FEIS
- 2000 SUIF Natural Resource Management Plan Update
- 2002 SUIF Oil/Gas Leasing EIS
- 2000 NMSPD General Management Plan.

Mule deer and elk are the principal big game species in the vicinity of Navajo Reservoir. Both deer and elk occupy the general area year round with increased use of the area in the winter. The mule deer population has stabilized since its decline in the 1970's, but their population levels are below the habitats' relative carrying capacities. Elk numbers have increased in New Mexico, resulting in increased competition with mule deer for adequate winter range; elk and livestock conflicts also have arisen. (USBR, 1999).

Perching birds (passerines) are common throughout the area. A number of species use the pinyon-juniper habitat and rocky outcrops common along the reservoir boundary. Along the riparian corridors, there is a general increase in the number and species of birds present. Use typically increases within the cottonwood/willow association found along the rivers. (USBR, 1999)

Several species of raptors are commonly observed in the area. They include the red-tailed hawk, Swainson's hawk, American kestrel, golden eagle, prairie falcon, osprey, great-horned owl, and western screech owl (USBR 1999).

Waterfowl use at and near the reservoir varies by season and type of use. The reservoir and its major tributaries are used year round, with increased waterfowl numbers during migration and winter. Waterfowl nesting and brooding currently occur in the Sambrito wetland areas and along the rivers. Wintering waterfowl typically use the reservoir, the river corridor, and scattered ponds and sloughs as both transitional staging areas and



**Map 3-3**  
**Important Wildlife Habitat**  
**Mule Deer and Elk**

- USBR Boundary
- Elk Production Area (CO)
- Mule Deer Winter Concentration (CO)
- Elk Winter Concentration (CO)
- Navajo Reservoir
- Mule Deer / Elk Severe Winter Range (CO)
- Mule Deer Winter Range (CO)
- Resident Mule Deer - Fawning (NM)
- Migratory Mule Deer and Elk Winter Range (NM)
- Resident Mule Deer (NM)
- Resident Mule Deer & Elk Year Round (NM)
- Resident Mule Deer & Elk Year Round - Elk Calving (NM)
- State Highways
- County Roads

The apparent differences in habitat use along the state line as shown on this map is due to differences in classifications and levels of information by state; actual mule deer and elk use of habitat on either side of the state line would likely be similar.



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wintering areas. The highest numbers of waterfowl using the reservoir are generally recorded in February (USBR 1999). Waterfowl species observed in and near the reservoir include mallard, gadwall, cinnamon teal, green-winged teal, American widgeon, northern shoveler, northern pintail, ring-necked duck, Canada goose, American coot, common merganser, lesser scaup, redhead, Barrow's goldeneye, common goldeneye, bufflehead, western grebe, and eared grebe (USBR 1999).

Several species of wading birds and shorebirds also occur in the area, including white pelican, great blue heron, and sandhill crane (USBR 1999)

There have been incidental sightings of rare and accidental birds in the reservoir area. These sightings include the red-throated loon, yellow-billed loon, tundra swan, wood duck, oldsquaw, surf scoter, white-winged scoter, vermillion flycatcher, and blue-throated hummingbird (USBR 1999).

### Sensitive Wildlife Species

The US Fish and Wildlife Service identified several sensitive wildlife species potentially present within or near the reservoir area or being affected by implementation of the RMP (FWS 1998, FWS 1999b). Table 3-6 lists those species and provides a summary of their current status, general habitat requirements, and known or potential occurrence near Navajo Reservoir.

**Table 3-6: Sensitive Wildlife Species, Navajo Reservoir Area**

Name	Status <sup>1</sup>	General Habitat Description	Occurrence Near the Reservoir Area
<b>BIRDS</b>			
American peregrine falcon ( <i>Falco peregrinus anatum</i> )	FSC CT NMT	<ul style="list-style-type: none"> <li>Nesting- tall cliffs in close proximity to water.</li> <li>Forages within riparian zones.</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Rare migrant, summer resident and breeder in the area (BISONM; Andrews/Righter 1992 ); may forage along the area's rivers (USBR 1999).</li> <li>Potential peregrine nesting sites include cliffs along the San Juan (USBR 2002) and Piedra Rivers (SUIT, 2000); there's an active nest on BLM lands near the reservoir (BLM 1999).</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>No known nests within the reservoir area (USBR 1999).</li> <li>Peregrines from a nearby nest on BLM lands may forage within the reservoir area (BLM 1999).</li> </ul>
Arctic peregrine falcon ( <i>Falco peregrinus tundrius</i> )	FSC (S/A)	<ul style="list-style-type: none"> <li>Breeds on the arctic tundra</li> <li>Winters in Central and South America</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Rare migrant throughout NM (Species Account 040385 BISON-M); presumed similar for CO.</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>Rare migrant</li> </ul>



Name	Status <sup>1</sup>	General Habitat Description	Occurrence Near the Reservoir Area
Baird's sparrow ( <i>Ammodramus bairdii</i> )	FSC NMT	<ul style="list-style-type: none"> <li>Breeds in the northern Great Plains from the Canadian Prairie Provinces, south to Montana and the Dakotas.</li> <li>Migrant in both CO and NM, mostly in the eastern plains and southern lowlands (NM)</li> <li>Winters generally south of the United States, though there are some records of wintering birds in southern NM and AZ.</li> </ul>	<p><b>General Area:</b></p> <ul style="list-style-type: none"> <li>Rare migrant in Rio Arriba and San Juan Counties, NM (Species Account 041785 BISON-M).</li> </ul> <p><b>Reservoir Area:</b></p> <ul style="list-style-type: none"> <li>Possible rare migrant.</li> </ul>
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	FT CT, NMT	<ul style="list-style-type: none"> <li><i>Winter foraging</i>- riparian areas, open water, wetlands, and uplands</li> <li><i>Perching/roosting</i>- ponderosa pine, mature cottonwood, and dense woodland canyons or stringers</li> <li><i>Nesting</i>- tall tree or snag, or less frequently, on top of a cliff.</li> </ul>	<p><b>General Area:</b></p> <ul style="list-style-type: none"> <li>Large migrant and wintering population along the reservoir and major rivers.</li> <li>1 intermittently active nest in CO on private land north of the reservoir. (USBR 1999)</li> </ul> <p><b>Reservoir Area:</b></p> <ul style="list-style-type: none"> <li>Large migrant and wintering population.</li> <li>Five known communal roost sites- 3 in NM; 2 in CO.</li> <li>No known nesting.</li> </ul> <p><b>Special Designations</b></p> <ul style="list-style-type: none"> <li>Winter Concentration Areas (CO): Piedra, San Juan, and Los Pinos Rivers in CO, south to Navajo Reservoir (CDOW)</li> <li>Winter Concentration Area (NM): Eul Canyon and San Juan River below dam (in addition to BLM's ACEC)</li> <li>37-Unit Bald Eagle ACEC around Navajo Reservoir in NM (BLM)</li> </ul>
Black tern ( <i>Chlidonias niger</i> )	FSC FS NMS4(N)	<ul style="list-style-type: none"> <li>Freshwater marshes and marshy lakes in summer; reservoirs and lakes</li> <li>Sandy coasts during migration</li> <li>Nests in large cattail marshes adjacent to open water.</li> <li>Winters south of US-Mexico border on sandy coasts.</li> </ul>	<p><b>General Area:</b></p> <ul style="list-style-type: none"> <li>Rare to uncommon spring migrant in western CO valleys (Andrews/Righter 1992); presumed similar for NW NM.</li> <li>Occurs in La Plata County, CO (NDIS 2004) and Rio Arriba and San Juan counties, NM (Species Account 042050 BISON-M).</li> <li>Likely a regular migrant that forages over ponds and uses open riparian areas and emergent wetlands on FFO lands (BLM 2003a).</li> </ul> <p><b>Reservoir Area:</b></p> <ul style="list-style-type: none"> <li>Likely similar to above; no surveys conducted.</li> </ul>
Ferruginous hawk ( <i>Buteo regalis</i> )	FSS CSC NMS2(B) NMS4(N)	<ul style="list-style-type: none"> <li>Grasslands and semi-desert shrublands; within the transitional zone between pinyon-juniper woodlands and open semi-desert shrublands or grasslands; rare in pinyon-juniper woodlands.</li> <li>Nesting sites include trees, ledges, large rock outcrops, low cliffs, and windmills or power poles between pinyon-juniper and sagebrush valleys or rolling grasslands.</li> </ul>	<p><b>General Area:</b></p> <ul style="list-style-type: none"> <li>Uncommon (USBR 1999) to rare migrant and winter visitor in SW CO (Andrews and Righter 1992)</li> <li>Occurs in the four counties surrounding the reservoir and may breed in the area. (NDIS 2004 and Species Account 040805 BISON-M).</li> <li>5-7 active nests recently on FFO lands (BLM 2003a)</li> </ul>

Name	Status <sup>1</sup>	General Habitat Description	Occurrence Near the Reservoir Area
			<b>Reservoir Area:</b> <ul style="list-style-type: none"> <li>May occur; no surveys conducted.</li> <li>One individual recorded at Navajo Dam on July 14, 1972.</li> </ul>
Gray vireo ( <i>Vireo vicinior</i> )	NMT	<ul style="list-style-type: none"> <li>Open, dry rocky slopes at lower pinyon-juniper elevation; in canyons and foothills</li> <li>Dry brush, especially juniper in SW mountains; scrub oak and other chaparral types</li> <li>Breeds in much of the SW US and Mexico.</li> <li>Winters south of US-Mexico border.</li> </ul>	<b>General Area</b> <ul style="list-style-type: none"> <li>Uncommon and very local summer resident on mesas and low foothills in western CO including La Plata County (Andrews and Righter 1992); presumed similar for NW NM</li> <li>Breeds in pinyon-juniper woodlands on FFO and is fairly common (BLM 2003a).</li> <li>Documented by BLM near the northeast end of Frances Arm (ENSR 1998)</li> </ul> <b>Reservoir Area</b> <ul style="list-style-type: none"> <li>May occur as an uncommon to fairly common, very local summer resident and breeder; no surveys conducted.</li> </ul>
Interior least tern ( <i>Sterna antillarum athalassos</i> )	FE NME	<ul style="list-style-type: none"> <li>Shallow waters of lakes and rivers, primarily in the Mississippi Basin.</li> <li>Breeding birds nest on bare sandy shorelines of islands in reservoirs.</li> <li>Migrants occur at reservoirs, lakes, and rivers with bare sandy shorelines.</li> </ul>	<b>General Area</b> <ul style="list-style-type: none"> <li>May be an occasional visitor to rivers in the area. (USBR 2003a)</li> </ul> <b>Reservoir Area</b> <ul style="list-style-type: none"> <li>Presumed similar to above; no surveys conducted.</li> </ul>
Loggerhead shrike ( <i>Lanius ludovicianus</i> )	FSS CSC NMS5	<ul style="list-style-type: none"> <li>Open riparian areas, agricultural areas, grasslands, and shrublands, especially semi-desert shrublands; occasionally open forest; generally from about 2,800 to 9,000 feet elevation (Species Account 041750 BISON-M)</li> <li>Breeding birds are usually near isolated trees or large shrubs (NDIS 2004).</li> </ul>	<b>General Area</b> <ul style="list-style-type: none"> <li>Occurs in the four counties surrounding the reservoir (NDIS 2004 and Species Account 041750 BISON-M).</li> <li>Is found in desert scrub and grassland habitat on FFO lands (BLM 2003a)</li> <li>Nesting between Farmington and the Hogback was documented in 1976 (Species Account 041750 BISON-M).</li> </ul> <b>Reservoir Area</b> <ul style="list-style-type: none"> <li>May occur in its general habitat within the reservoir area, however, no surveys have been conducted.</li> </ul>
Mexican spotted owl ( <i>Strix occidentalis lucida</i> )	FT CT	<ul style="list-style-type: none"> <li>Mountains and canyons in multi-storied forests and woodlands with dense canopies and understory;</li> <li>Mesas, benches, and warm slopes; narrow canyons with thermal protection and rock component;</li> <li>Often associated with ponderosa pine and Douglas fir stringers, but may be found in little to no vegetation</li> </ul>	<b>General Area</b> <ul style="list-style-type: none"> <li>Historic resident.</li> <li>Documented in Archuleta County, CO (Andrews and Righter 1992) and in the Carson National Forest about 10 miles east of the reservoir (USBR 1999).</li> <li>Unconfirmed sighting report on Southern Ute Reservation northeast of the reservoir (SUIT 1990)</li> </ul> <b>Reservoir Area</b> <ul style="list-style-type: none"> <li>No current known occurrence (USBR 1999), no surveys conducted.</li> </ul>

Name	Status <sup>1</sup>	General Habitat Description	Occurrence Near the Reservoir Area
Mountain plover ( <i>Charadrius montanus</i> )	FPT CSC	<ul style="list-style-type: none"> <li>Short-grass grassland, primarily on level areas with very short grass and scattered cactus.</li> <li>Migrants sometimes occur on dry mudflats and shorelines of dry reservoirs.</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Possible rare migrant.</li> <li>Irregular visitor, mostly fall and early winter, to western CO valleys; not identified as occurring in La Plata or Archuleta counties (NDIS 2004); presumed similar for NW NM.</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>Likely similar to above; no survey conducted.</li> </ul>
Southwestern willow flycatcher ( <i>Empidonax traillii extimus</i> )	FE CE NME	<ul style="list-style-type: none"> <li>Nesting habitat includes willow thickets, tamarisk, shrubby mountain meadows, and deciduous woodlands along streams, lakes, and bogs</li> <li>Often associated with a scattered overstory of cottonwoods (USFWS 1995) or box-elders.</li> </ul> <p><b>Critical Habitat-</b> USFWS did not designate any SWWF critical habitat in Colorado or New Mexico.</p>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Potential SWWF habitat along San Juan, Piedra, and Los Pinos Rivers.</li> <li>Documented WFC migrants on San Juan River below the dam and on Piedra arm.</li> <li>Documented WFC nesting <ul style="list-style-type: none"> <li>Los Pinos River, north of Ignacio, CO. (Stroh personal communication, 2004)</li> <li>San Juan River, near Shiprock, NM. (Ecosphere 1999)</li> </ul> </li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>Potential SWWF habitat: <ul style="list-style-type: none"> <li>Upper portions of the river arms.</li> <li>SJR below dam.</li> </ul> </li> <li>Documented WFC migrants <ul style="list-style-type: none"> <li>Piedra arm in 1999 (Ecosphere, 1999a)</li> <li>SJR below dam in 1998 (Ecosphere, 1999) and 2004 (Ecosphere 2004)</li> </ul> </li> <li>No WFC or SWWF nesting documented as of 6/15/2004.</li> </ul>
Western burrowing owl ( <i>Athene cunicularia hypugaea</i> )	FSC CT	<ul style="list-style-type: none"> <li>Grasslands, open shrublands, and open woodlands, generally in or adjacent to prairie dog towns, from about 2,800 to 7,500 feet in elevation</li> <li>Nests in abandoned burrows of prairie dogs, ground squirrels, foxes, marmots, and badgers; may nest in culverts</li> <li>Neotropical migrant (Species Account 041320 BISON-M)</li> </ul>	<p><b>General Area:</b></p> <ul style="list-style-type: none"> <li>Rare in southwestern CO (Andrews and Righter 1992), known to occur in La Plata County (NDIS 2004).</li> <li>Potential habitat (historic Gunnison's prairie dog colony) located in CO, north of the Sambrito Wildlife Area; unknown whether burrowing owls occur there. (USBR 1999)</li> <li>Breeding birds have been reported for San Juan County, NM; occurrence in Rio Arriba County, NM is unverified (Species Account 041320 BISON-M)</li> </ul> <p><b>Reservoir Area:</b></p> <ul style="list-style-type: none"> <li>May occur, but no surveys for its presence have been conducted.</li> <li>Potential habitat (historic Gunnison's prairie dog colony) in CO along northern edge of Sambrito Wildlife Area. (USBR 1999)</li> <li>No potential habitat has been identified around the reservoir in New Mexico. (USBR 1999)</li> </ul>
White-faced ibis ( <i>Plegadis chihi</i> )	FSC	<ul style="list-style-type: none"> <li>Shoreline and marsh habitats bordering open water; wet meadows, marsh edges and reservoir shorelines.</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Migrant and occasional summer resident in San Juan and Rio Arriba counties (Species</li> </ul>

Name	Status <sup>1</sup>	General Habitat Description	Occurrence Near the Reservoir Area
		<ul style="list-style-type: none"> <li>▪ Nests in colonies in shrubs and low trees or in dense standing reeds and tules near or in marshes.</li> <li>▪ Feeds in shallow ponds, marshes, irrigated lands, and wet meadows.</li> </ul>	<p>Account 040970 BISON-M)</p> <ul style="list-style-type: none"> <li>▪ Rare spring and fall migrant and very rare non-breeding summer visitor in western valleys of CO; known to occur in La Plata County (NDIS 2004)</li> <li>▪ Nesting confirmed in Montezuma County, CO (USBR 2003a); and reported at Stinking Lake (1988) in Rio Arriba County, NM (Species Account 040970 BISON-M).</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>▪ May occur infrequently during migration and forage near the Sambrito wetlands and along the Piedra and San Juan Rivers in CO (USBR 1999); presumed similar for the San Juan River in NM.</li> <li>▪ Possible potential for nesting.</li> </ul>
Yellow-billed cuckoo ( <i>Coccyzus americanus</i> )	FSC CE	<ul style="list-style-type: none"> <li>▪ Mature lowland broadleaf riparian forests with a dense woody understory.</li> <li>▪ Nests in cottonwood/willow riparian habitat along rivers (BLM 2003a)</li> <li>▪ Neotropical migrant; winters in mature tropical forests (Species Account 042050 BISON-M).</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>▪ Uncommon local summer resident in southwestern CO valleys; occurs in La Plata County. (NDIS 2004)</li> <li>▪ One sighted on Piedra River north of the reservoir by SUIT biologist about 4-5 years ago.</li> <li>▪ Rare to fairly common migrant and summer resident in NM; occurs in San Juan and Rio Arriba counties (Species Account 040250 BISON-M).</li> <li>▪ Small numbers present on San Juan River during migration; some evidence of breeding. (USBR 2003a).</li> <li>▪ Very rare in the San Juan River Valley (BLM 2003a).</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>▪ May occur, but no surveys for its presence have been conducted.</li> </ul>
<b>MAMMALS</b>			
Allen's big-eared bat ( <i>Idionycteris phyllotis</i> )	SSS	<ul style="list-style-type: none"> <li>▪ Conifer and deciduous forests and cottonwood and willow stands along rivers and streams</li> <li>▪ roosts in rocky areas, including cliffs, outcrops, and lava beds</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>▪ Could occur (USBR 1999).</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>▪ May occur, but no surveys for its presence have been conducted.</li> </ul>

Name	Status <sup>1</sup>	General Habitat Description	Occurrence Near the Reservoir Area
Big free-tailed bat ( <i>Nyctinomops macrotis</i> )	FSC	<ul style="list-style-type: none"> <li>Occurs in coniferous and mixed woodlands and shrublands, and associated riparian areas, generally between 4,000 and 7,000 feet elevations.</li> <li>Depends on rocky cliffs for roosting sites; roosts in caves, rock crevices, cliff face crevices, and buildings.</li> <li>The availability of suitable drinking sites (large, obstacle-free ponds) may possibly limit distribution.</li> </ul> (CO NDIS; Species Account 050037 BISON-M)	<b>General Area</b> <ul style="list-style-type: none"> <li>Identified for the area (USBR 1999).</li> <li>Likely to occur in La Plata County, CO (NDIS 2004); may also occur in Archuleta County.</li> <li>Occurs in San Juan and Rio Arriba counties, NM; documented maternity colony (1975) along Pine River in San Juan County (Species Account 050037 BISON-M)</li> <li>Detected at 2 locations on FFO and 4 on Jicarilla Ranger District (BLM 2003a)</li> </ul> <b>Reservoir Area</b> <ul style="list-style-type: none"> <li>Rare; reported along Los Pinos Arm (USBR 1999)</li> </ul>
Cave myotis ( <i>Myotis velifer</i> )	FSC	<ul style="list-style-type: none"> <li>Desert and grasslands with perennial water available</li> <li>roosts primarily in caves and mines, and sometimes buildings</li> </ul>	<b>General Area</b> <ul style="list-style-type: none"> <li>Could occur (USBR 1999).</li> <li>Not yet documented in CO (NDIS 2004)</li> </ul> <b>Reservoir Area</b> <ul style="list-style-type: none"> <li>Unknown occurrence; no surveys conducted.</li> </ul>
Fringed myotis ( <i>Myotis thysanodes</i> )	FSC	<ul style="list-style-type: none"> <li>Variety of vegetation types, including grass lands, ponderosa pine, pinyon-juniper, mixed shrub, sagebrush, riparian, and cropland to about 7,500 feet in elevation.</li> <li>Day and night roosts include caves, mines, rock crevices, and buildings</li> <li>Maternity/nursery colonies roost in caves, abandoned mines, large ponderosa pine snags, and live ponderosa pine trees with vertical cracks and loose bark.</li> </ul> (NDIS 2004; Species Account 050047 BISON-M)	<b>General Area:</b> <ul style="list-style-type: none"> <li>Could occur (USBR 1999).</li> <li>Occurs in La Plata and Archuleta counties, CO (NDIS 2004) and San Juan and Rio Arriba counties, NM (BISON-M 2004).</li> <li>Not detected on FFO lands in 1997 and 1998, but captured 21 times on Jicarilla Ranger District (BLM 2003a)</li> </ul> <b>Reservoir Area:</b> <ul style="list-style-type: none"> <li>May occur, but no surveys for its presence have been conducted.</li> </ul>
Long-eared myotis ( <i>Myotis evotis</i> )	FSC	<ul style="list-style-type: none"> <li>Coniferous forests at moderate elevations, including, pinyon-juniper woodlands, ponderosa pine, and sub-alpine forests.</li> <li>Day roosts include tree cavities, under bark, and in buildings.</li> <li>Night roosts similar to day, plus caves and mines.</li> </ul> (NDIS 2004; Species Account 050057 BISON-M)	<b>General Area</b> <ul style="list-style-type: none"> <li>Occurs in San Juan and Rio Arriba counties, NM (BISON-M 2004) and La Plata County; likely to occur in Archuleta County, CO (NDIS 2004).</li> <li>BLM documented presence on uplands 2-3 miles from the reservoir during summer surveys in 1996 and 1997 (USBR 1999).</li> <li>Captured numerous times on FFO and Jicarilla Ranger District (BLM 2003a).</li> </ul> <b>Reservoir Area</b> <ul style="list-style-type: none"> <li>May occur, but no surveys for its presence have been conducted.</li> </ul>

Name	Status <sup>1</sup>	General Habitat Description	Occurrence Near the Reservoir Area
Long-legged myotis ( <i>Myotis volans</i> )	FSC	<ul style="list-style-type: none"> <li>Uses variety of habitats from about 6,000 to 9,000 feet elevation, including desert scrub, mixed-oak woodlands, pinyon-juniper woodlands, ponderosa pine, riparian, and spruce-fir forests.</li> <li>Roosts in trees, buildings, rock crevices, ground fissures, and under tree bark. (Species Account 050059 BISON-M 2004; NDIS 2004)</li> </ul>	<p><b>General Area:</b></p> <ul style="list-style-type: none"> <li>Occurs in San Juan and Rio Arriba counties, NM (BISON-M 2004) and La Plata and Archuleta counties, CO (NDIS 2004).</li> <li>BLM documented presence on uplands 2-3 miles from the reservoir during summer surveys in 1996 and 1997 (USBR 1999).</li> <li>Captured numerous times on FFO and Jicarilla Ranger District (BLM 2003a)</li> </ul> <p><b>Reservoir Area:</b></p> <ul style="list-style-type: none"> <li>May occur, but no surveys for its presence have been conducted.</li> </ul>
New Mexican meadow jumping mouse ( <i>Zapus hudsonius luteus</i> )	FSC NMT	<ul style="list-style-type: none"> <li>Herbaceous wetland habitats in valley and mountain areas in Arizona and New Mexico (BLM 2003a); including adjacent to irrigation drains and canals (Species Account 050410 BISON-M)</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>May occur in riparian habitat on FFO and AFO lands (BLM 2003a); also may occur in wetland habitats.</li> <li>Documented as occurring/breeding in eastern Rio Arriba County, NM, but no listing for San Juan County, NM (Species Account 050410 BISON-M 2004)</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>May occur, but no surveys for its presence have been conducted.</li> </ul>
Occult little brown bat ( <i>Myotis lucifugus occultus</i> )	FSC	<ul style="list-style-type: none"> <li>Variety of habitats, including pinyon-juniper woodlands, ponderosa pine forests, montane shrublands and riparian woodlands in vicinity of large permanent water sources.</li> <li>Roosts under bark, in hollow trees, in wood-piles, buildings and other structures, and less frequently in caves and mines.</li> <li>Maternity roosts situated in large snags. (NDIS 2004; Species Account 050032 BISON-M 2004)</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Could occur (USBR 1999).</li> <li>Occurs in La Plata County and likely to occur in Archuleta County, CO (NDIS 2004); not listed for San Juan and Rio Arriba counties, NM (BISON-M 2004), but may occur there.</li> <li>Not recorded during surveys on FFO and USFS lands, but could occur there (BLM 2003a).</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>May occur, but no surveys for its presence have been conducted.</li> </ul>
Pale Townsend's big-eared bat ( <i>Plecotus townsendii pallescens</i> )	FSC CSC	<ul style="list-style-type: none"> <li>Broad range of habitat from low arid desert to spruce-fir zone, including desert scrub, sagebrush, pinyon-juniper woodlands, and open montane forests from about 4,000 to 9,500 feet in elevation.</li> <li>Strong correlation with caves and cave-like roosting habitat; roosts in caves, mines, and man-made structures. (Species Account 050025 BISON-M 2004)</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Could occur (USBR 1999).</li> <li>Occurs in San Juan and Rio Arriba counties, NM (BISON-M 2004) and La Plata County, CO (NDIS 2004); may occur in Archuleta County, CO.</li> <li>Captured at two locations on FFO (BLM 2003a).</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>May occur, but no surveys for its presence have been conducted.</li> </ul>

Name	Status <sup>1</sup>	General Habitat Description	Occurrence Near the Reservoir Area
River otter ( <i>Lutra canadensis</i> )	FSC CE	<ul style="list-style-type: none"> <li>Riparian areas and perennial streams with high water quality and sufficient prey; ice-free water, sufficient water depth and stream width, and suitable shoreline access</li> </ul>	<p><b>General Area:</b></p> <ul style="list-style-type: none"> <li>Historically occurred throughout Colorado, but extirpated.</li> <li>CDOW began otter reintroduction in 1976, releasing animals along the Piedra River (Fitzgerald et al. 1994; BLM 1991b; USBR 1999).</li> </ul> <p><b>Reservoir Area:</b></p> <ul style="list-style-type: none"> <li>Occurs along the Piedra and San Juan arms of the reservoir in Colorado (USBR 1999)</li> </ul>
Small-footed myotis ( <i>Myotis ciliolabrum</i> )	FSC SSS	<ul style="list-style-type: none"> <li>Woodlands and desert communities, rocky areas;</li> <li>Roosts in caves, abandoned buildings, under rocks, in rock crevices, in burrows, and under pine bark;</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>BLM documented presence on uplands 2-3 miles from the reservoir during summer surveys in 1996 and 1997 (USBR 1999).</li> </ul> <p><b>Reservoir Area</b></p> <p>May occur, but no surveys for its presence have been conducted.</p>
Spotted bat ( <i>Euderma maculatum</i> )	FSC NMT	<ul style="list-style-type: none"> <li>Uses a variety of habitats from 3,000 to 11,000 feet in elevation near rocky cliffs with nearby perennial water. Habitats include: riparian, semi-desert shrub land, pinyon-juniper woodland, ponderosa pine forest, and spruce-fir forest.</li> <li>Roosts in cliff crevices and cracks, and under loose rocks.</li> <li>Prefers to forage over standing water.</li> <li>Apparently migrates to lower elevations to winter. May hibernate in caves. (Species Account 050095 BISON-M)</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Presence documented using echo-locators (USBR 1999).</li> <li>Audibly detected once on FFO and once on Jicarilla Ranger District (BLM 2003a).</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>May occur, but no surveys for its presence have been conducted.</li> </ul>
Yuma myotis ( <i>Myotis yumanensis</i> )	FSC	<ul style="list-style-type: none"> <li>Variety of habitats, including desert, grass-land, woodland, forest, and associated riparian communities from about 4,000 to 7,000 feet in elevation and close to permanent water sources such as rivers, streams, canals, and ponds.</li> <li>Day roosts in buildings, caves, mines, rock crevices, and swallow nests; night roosts in buildings, under ledges, or similar shelters.</li> <li>Forages over water, along edges, and between shrubs and trees.</li> <li>Migratory species. (NDIS 2004; Species Account 050103 BISON-M 2004)</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Reported near Allison, CO.</li> <li>Occurs in San Juan and Rio Arriba counties, NM (BISON-M 2004) and La Plata County, CO (NDIS 2004); likely to occur in Archuleta County, CO (NDIS 2004).</li> <li>BLM documented presence on uplands 2-3 miles from the reservoir during summer surveys in 1996 and 1997 (USBR 1999).</li> <li>Captured once on FFO (BLM 2003a).</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>May occur, but no surveys for its presence have been conducted.</li> </ul>
<b>REPTILES</b>			
Blackneck garter snake ( <i>Thamnophis cyrtopsis</i> )	FSC	<ul style="list-style-type: none"> <li>Riparian habitats along perennial and intermittent streams, seeps and springs, and irrigation diversions;</li> <li>Dependent on riparian areas, but may wander into upland areas</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Common across its range, but uncommon to rare in Colorado (USBR 1999).</li> <li>Documented along the Piedra River in 1960. (USBR 1999)</li> <li>Occurs in southern La Plata and Archuleta counties in SW Colorado, at an elevation of up to 6,500 feet. (CDOW, 2000 NDIS website)</li> </ul>

Name	Status <sup>1</sup>	General Habitat Description	Occurrence Near the Reservoir Area
			<ul style="list-style-type: none"> <li>NM- presumed similar to above; there are museum specimens from both San Juan and Rio Arriba counties (BISONM, 2004).</li> </ul> <p><b>Reservoir Area</b> May occur, but no surveys for its presence have been conducted.</p>
Southern plateau lizard ( <i>Sceloporus undulatus tristichus</i> )	FSC	<ul style="list-style-type: none"> <li>Rocky areas in a variety of vegetation types.</li> <li>Trees and rocks at relatively high elevation where oaks are dominant or at least prominent.</li> </ul> <p>(BISONM 2004)</p>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>True subspecies known to occur in Archuleta County, CO; integrates with other subspecies outside of the county.</li> <li>Historically reported along the Piedra River south along the current reservoir boundary.</li> <li>Last documented along the Piedra River, north of Navajo Reservoir in the 1970's. (USBR 1999)</li> <li>NM- presumed similar to above</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>May occur, but no surveys for its presence have been conducted.</li> </ul>
<b>FISH</b>			
Colorado pikeminnow ( <i>Ptychocheilus lucius</i> )	FE CT NME	<ul style="list-style-type: none"> <li>Major tributaries of the Colorado River basin.</li> </ul> <p><b>Critical Habitat-</b> San Juan River and its 100-year floodplain from NM State Route 371 bridge (Sec. 17, T29N, R13W, NMPM) to the full pool elevation at Neskahai Canyon on the San Juan arm of Lake Powell (Sec. 26, T41S, R11E, SLPM) (USFWS 2000)</p>	<p><b>General Area:</b></p> <ul style="list-style-type: none"> <li>Small reproducing population in San Juan River below Farmington, NM.</li> <li>Populations being augmented by stocking.</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>No pikeminnow within reservoir area.</li> </ul>
Razorback sucker ( <i>Xyrauchen texanus</i> )	FE CE NME	<ul style="list-style-type: none"> <li>Major tributaries of the Colorado River basin, including the San Juan River.</li> </ul> <p><b>Critical Habitat-</b> San Juan River and its 100-year floodplain from the Hogback Diversion (Sec. 9, T29N, R16W, NMPM) to the full pool elevation at the mouth of Neskahai Canyon on the San Juan arm of Lake Powell (Sec. 26, T41S, R11E, SLPM) (USFWS, 2000)</p>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Occurs in San Juan River from Lake Powell to near the Hogback Diversion</li> <li>Extremely rare in the San Juan River</li> <li>Populations being augmented by stocking.</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>No razorback suckers occur within the reservoir area.</li> </ul>
Roundtail chub ( <i>Gila robusta</i> )	FC FSC NME	<ul style="list-style-type: none"> <li>Relatively common in parts of the Upper Colorado River Basin, including the San Juan River (USBR 2003a)</li> <li>Inhabits pools, eddies, runs, and riffles in streams and impounded areas (USBR 1999).</li> <li>Adults prefer pools with abundant cover; young fish use shallower water with relatively low flows. Runs and riffles are utilized primarily during feeding periods.</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Uncommon, but distribution in the San Juan River extends from its inflow to Navajo Reservoir downstream to more than 100 miles below the Four Corners Bridge.</li> <li>Small population in San Juan River below the dam and its tributaries (USBR 2003a).</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>Rare within the reservoir area (USBR 2003a).</li> </ul>



Name	Status <sup>1</sup>	General Habitat Description	Occurrence Near the Reservoir Area
<b>INVERTEBRATES</b>			
New Mexico silverspot butterfly ( <i>Speyeria nokomis nitocris</i> ) (aka Mountain silverspot butterfly)	FSC	<ul style="list-style-type: none"> <li>Moist habitats around marshes and along streams (USBR 2003a).</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Identified as occurring year-round in NM in Catron, Cibola and Grant counties, but not in Rio Arriba and San Juan counties</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>Unknown occurrence; no surveys conducted.</li> </ul>
San Juan checkerspot butterfly ( <i>Euphydryas anicia chuskae</i> ) (aka Chuskae Mountains checkerspot butterfly)	FSC	<ul style="list-style-type: none"> <li>Type locality is the Chuska Mountains, San Juan County, NM. (Species Account #215590, BISON-M, 2000)</li> <li>Moist habitats around marshes and along streams (USBR 2003a)</li> <li>Found at high altitudes in alpine tundra and pine forests in the Chuska Mountains, McKinley and San Juan counties, NM (BLM 2003a)</li> </ul>	<p><b>General Area</b></p> <ul style="list-style-type: none"> <li>Regular, year-round occurrence, including breeding, in Rio Arriba and San Juan Counties, NM (Species Account #215590 BISON-M, , 2000)</li> </ul> <p><b>Reservoir Area</b></p> <ul style="list-style-type: none"> <li>Not likely to occur within the reservoir area; due to lack of general habitat.</li> </ul>
San Juan tiger beetle ( <i>Cicindela lengi jordai</i> )	FSC	<ul style="list-style-type: none"> <li>Sandy areas and sandy washes, including riparian areas. (USBR 2003a);</li> <li><i>C. lengi</i> habitat is typically open sandy areas such as dunes and sandy road sides (Hoback/Riggins 2001); sand dunes and sandy blowouts (Pearson, etal. 2004).</li> </ul>	<p><b>General Area:</b></p> <ul style="list-style-type: none"> <li><i>C. l. jordai</i> may occur in the general area.</li> <li><i>C. lengi</i> was not reported for San Juan and Rio Arriba Counties NM, or La Plata and Archuleta counties, CO (Hoback/Riggins 2001).</li> <li><i>C. lengi</i> has been identified in NM, but no exact location had been reported as of 1999 (Species Account 190246, BISON-M, 2004)</li> <li>A general distribution map for <i>C. lengi</i> includes northern San Juan County, NM to about the reservoir and north into CO (Pearson, etal. 2004)</li> <li>Found along sandy washes in May and June in portions of San Juan County (BLM 2003a)</li> </ul> <p><b>Reservoir Area:</b></p> <ul style="list-style-type: none"> <li>Unknown occurrence; no surveys have been conducted.</li> </ul>

<sup>1</sup> *Federal status:*

**FE:** Endangered- A species in danger of extinction throughout all or a portion of its range.

**FT:** Threatened- A species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

**FC:** Candidate- Taxa for which the Service has sufficient information to propose that they be added to the list of endangered and threatened species, but the listing action has been precluded by other higher priority listing activities.

**FSC:** Species of concern- Taxa for which further biological research and field study are needed to resolve their conservation status.

**FSS:** Sensitive species- Species designated as a sensitive species or a species of concern by one or more federal agencies, other than USFWS.

*Colorado status:*

**CE:** Endangered: Any species or subspecies of native wildlife whose prospects for survival or recruitment within Colorado are in jeopardy as determined by the commission.

**CT:** Threatened: Any species or subspecies of wildlife in Colorado, which, as determined by the commission, is not in immediate jeopardy of extinction but is vulnerable because it exists in such small numbers or is so extremely restricted throughout all or a significant portion of its range that it may become endangered.

**CSC:** Species of Concern:

*New Mexico status:*

**NME:** Endangered (Endangered, Group 1): Any species or subspecies whose prospects of survival or recruitment in New Mexico are in jeopardy.

**NMT:** Threatened (Endangered, Group 2): Any species or subspecies whose prospects of survival or recruitment in New Mexico are likely to be in jeopardy within the foreseeable future.

## Fisheries

The reservoir supports both cold-water and warm-water fish. Cold-water game fish species include kokanee salmon, rainbow trout, brown trout, and northern pike. Warm-water game fish species include channel catfish, white crappie, black crappie, bluegill, ringed/yellow perch, largemouth bass, smallmouth bass and black bullhead. Non-game, non-native fish species in the reservoir include: common carp, golden shiner, and white sucker. Non-game, native fish species in the reservoir include: roundtail chub, flannemouth sucker, and bluehead sucker. Kokanee and rainbow trout populations are maintained by stocking; the others are maintained through natural reproduction. (USBR 1999 and NavOps PFEIS)

The three major tributaries to the reservoir, Los Pinos, Piedra, and San Juan Rivers also contain both cold-water and warm-water fish species. Fish populations in these streams are dominated by non-game species such as mottled sculpin, speckled dace, and suckers (USBR 1999). Kokanee occur above the reservoir in these rivers only during their fall spawning period. Relatively low numbers of rainbow and brown trout are found in these streams throughout the year. The lower 10 to 15 miles of these streams are considered marginal quality trout habitat due to: (1) relatively high summer temperatures; (2) relatively high silt loads (Piedra and San Juan Rivers); and (3) irrigation withdrawals and return flows (mainly Los Pinos and San Juan Rivers) (USBR 1999).

For about 16.4 miles from the dam to the Hammond diversion, the San Juan River currently supports a trout fishery due to reservoir water releases. The NMDGF manages the first 4.4 miles of this stretch below the dam as “Quality Waters” for trout. Trout species present in these waters include rainbow and brown trout. Rainbow trout populations are sustained mainly through stocking, while brown trout numbers are maintained by natural reproduction. Non-native, non-game fish within this stretch of river include: common carp, and fathead minnows. Native fish within this stretch of river include: speckled dace, bluehead and flannemouth suckers. (USBR 1999; USBR 2003b)

Below the Hammond diversion, the San Juan River is essentially a warm water fishery. Native fish species include: Colorado pikeminnow, razorback sucker, roundtail chub, bluehead and flannemouth suckers, and speckled dace. Non-native fish species include channel catfish, common carp, white suckers, and fathead minnows. (USBR 1999; USBR 2003b)

## Cultural Resources

### General

Cultural resources are physical or other expressions of human activity or occupation, including culturally significant landscapes, prehistoric and historic archaeological sites and isolated artifacts or features, historic structures, human burials, sacred sites, and traditional cultural properties (TCPs). TCPs are sites or areas of important cultural value to existing communities and may not have actual physical remnants associated with their

existence. Cultural resources are protected under the National Historic Preservation Act of 1966, as amended in 1992 (NHPA), the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), Executive Order 13007 (EO 13007) - Protection of Native American Sacred Sites, and other state, agency, or tribal laws and policies.

Under the NHPA, a historic property is defined as one that meets one or more of the eligibility criteria for the National Register of Historic Properties (NRHP). These include prehistoric or historic archaeological sites or properties of historic interest or cultural significance to a community or ethnic or social group and other cultural resources as defined above. Historic properties may also be protected under the NAGPRA and EO 13007, and other state, agency, or tribal laws and policies.

Under NAGPRA, cultural items, which include Native American burials, grave goods, and sacred objects, are protected. Cultural items may only be removed under certain conditions. EO 13007 protects access to places of religious significance to Native Americans.

While archaeological data provide some information about prehistoric and historic aboriginal use of the area, each tribe ties to the area has its own account of that tribe's traditional use of the area. In the Navajo Reservoir Operations EIS, 15 current Native American Tribes were identified as having ancestral and contemporary ties to the reservoir area. These tribes include the Hopi, the Jicarilla Apache, the Navajo, the Jemez, the Nambe, the Pojoaque, the San Ildefonso, the Santa Clara, the Taos, the Laguna, the Southern Ute, the Zuni, the Tesuque, the San Juan, and the Picuris (USBR 2003b).

The reservoir area is located in one of the richest archaeological regions of the U.S. and is within an informal archaeological district known as the Navajo Reservoir District. This District was originally defined by salvage archaeology considerations for Navajo Dam and Reservoir, but has not been formally evaluated for its eligibility to the NRHP. Surveys and excavations conducted between 1956 and 1962 for the dam and reservoir were one of the largest mitigation projects ever conducted for a water project in the United States prior to the passage of NHPA. That mitigation effort established the richness and diversity of the archaeological resources at Navajo Reservoir. The Navajo Reservoir District was conceived to represent the findings in the reservoir area in relationship to other recognized archaeological Districts (e.g., Chaco Canyon, La Plata, Gobernador) in the region. The Navajo Reservoir District was further subdivided into geographic sections (Upper Pine, Lower Pine, Frances, La Jara, Burnt Mesa, Bancos, Rosa, Piedra, and Sandoval) to facilitate research. Subsequent, additional archaeological work related to mineral development in the area, has significantly increased the understanding of the prehistory and history of the area, and has defined a cultural sequence which extends well beyond the District.

Since the passage of NHPA, cultural resources studies related to oil and gas and recreational development have been conducted within the reservoir area above the reservoir's high water line. Recently, Reclamation undertook several studies to assess the impacts of reservoir operations on cultural resources.

### **Cultural Traditions**

Known cultural traditions at the reservoir include the Archaic Period (3000 to 500 B.C.), several phases of the Pueblo Period (A.D. 1-1050), the Navajo Period (A.D. 1450-1775,

and the Euro-American Settlement Period (A.D. 1870- Present). These cultural traditions are described as follows:

#### *Archaic Period*

The Archaic period in the region is typified by a change from a big-game hunting emphasis to the hunting of smaller game and the intensive collection and use of plant foods. Most sites of this period date between 6000 B.C. to A.D. 1.

#### *Pueblo Period*

The majority of sites at the reservoir date to this time period.

#### *Basketmaker II Period*

The Basketmaker II period is characterized by the adoption of structures and features for habitation and storage of surplus foods. Basketmaker culture was named for its finely woven baskets and lack of pottery. Basketmaker II sites appear to date between A.D. 200 and 400.

#### *Basketmaker III Period*

The Basketmaker III period (A.D. 400 -700) marks the beginning of a more sedentary agricultural lifestyle and the use of ceramics and adoption of the bow and arrow. This period also represents the beginnings of the typical Ancestral Pueblo (Anasazi) site layout.

#### *Pueblo I Period*

The Pueblo I period (A.D. 700 – 900) is well represented with small hamlets scattered across the project area. It is during this period that surface structures, identified as pueblos, become increasingly common.

#### *Pueblo II and III Periods*

The Pueblo II and III periods (A.D. 900 – 1300) are characterized by larger pueblos which usually include masonry room blocks and larger semi-circular pit structures, called kivas. These are the ruins, such as those at Mesa Verde National Park, familiar to most modern visitors. The Pueblo III period is poorly represented in the Navajo Reservoir District and is the last vestige of Puebloan occupation in the area.

#### *Navajo Period*

The Navajo, the Jicarilla Apache, and the Southern Ute began occupying the lands in and around Navajo Reservoir as early as the 1400s. Most of the sites at the reservoir from this time period are attributed to the Navajo.

The Navajo occupation of the Navajo Reservoir District is divided into three time frames: the Dinétah, the Gobernador, and the Post-Gobernador. The Dinétah phase applies to the era of the earliest Athapaskan-speaking groups. While the present-day Navajo consider the Navajo Reservoir District their homeland (from which the name Dinétah is derived), archaeologists believe the Athapaskans entered the region in the 1400s and occupied the

area for about 250 years. The Gobernador phase applies to the area of acculturation following the Spanish re-conquest of the region from 1692 through 1696, after the Pueblo Revolt of 1680. In the late 17<sup>th</sup> century, the Gobernador Navajo left the region, and apparently did not return until the Post-Gobernador period (mid-1800s), by which time the Navajo had fully adopted a pastoral way of life. In 1868, a treaty was signed (and amended in subsequent years) which established the Navajo Indian Reservation immediately west of the Navajo Reservoir District.

The Jicarilla Apache are also Athapaskan speakers and their ancestors in the area may derive from the same stock as the Dinétah phase. Their homeland is identified as the area extending between the Arkansas and Chama river valleys north and east of Navajo Reservoir. By 1700, the group distinguishable as the Jicarilla Apache had emerged. Beginning in 1874, an executive order was issued which set aside several reservations for the Jicarilla Apache, one of which included a portion of the present Navajo Reservoir. However, the Jicarilla never took up residence there. In 1887, an area immediately east of Navajo Reservoir eventually became what is now the Jicarilla Apache Nation Reservation.

Very little is known of the antiquity of the Colorado Ute Tribes. It is possible that the first Shoshonean speaking groups (of which the Utes are part) entered southwestern Colorado from the north and west, as early as the 1200's, coinciding with the Puebloan departure from the area. The first historical references to the Utes (from Spanish explorers) date to 1626, at which time their range extended to parts of northwest New Mexico. In the 1870's, the Southern Ute Indian Reservation (since divided into the Southern Ute and Ute Mountain Ute Indian Reservations) was established, and includes the Colorado side of Navajo Reservoir. In the 1960s, the Federal Government acquired some Southern Ute Reservation lands for Navajo Unit project purposes in exchange for lands adjacent to the reservation elsewhere.

#### **Euro-American Settlement Period**

By 1765, Spaniards from New Mexico settlements had visited the Navajo Reservoir region. In 1776, the Dominguez-Escalante expedition passed by what is now the upper end of Navajo Reservoir. In the following decades, Spanish and Mexican traders opened a trade route to California, known as the Old Spanish Trail, which followed the Dominguez-Escalante route through the project area. The trail continued to be used until 1848.

Beginning about 1870, emigrants of Hispanic descent began establishing settlements in the Navajo Reservoir region, including the towns of Rosa and Arboles. In the 1880s, a railroad line connecting Chama, New Mexico with Durango, Colorado, was constructed through the area. However, in the 1950s, the towns and the railroad were abandoned in preparation for the filling of Navajo Reservoir. While mostly beneath the waters of the reservoir and/or having been removed at the time of abandonment, some remnants of the Euro-American historic period can still be observed.

#### **Cultural Resource Sites**

Information on cultural resource sites in the Navajo Reservoir area was obtained through the New Mexico and Colorado State Historical Preservation Offices, BLM, surveys conducted on behalf of Reclamation, and consultations with Native American tribes or

nations with an affiliation to the reservoir area.

A study area was identified for salvage archaeology considerations for the Navajo Unit prior to its construction. Cultural resources surveys and excavations were conducted between 1956 and 1962. During the initial archaeological reconnaissance survey for the reservoir (1956-1959) 526 sites were found; 454 within the reservoir's maximum pool area. While this mitigation effort emphasized cultural sites within the inactive zone of the reservoir, it expanded the understanding of the prehistory and history of the area and defined a cultural sequence extending beyond the reservoir area.

There is a high density of archaeological sites within the Navajo Reservoir District and it is presumed that a fair proportion of these sites are eligible for inclusion to the NRHP. BLM estimates that about 80% of the cultural resource sites within the San Juan Basin may be eligible to the NRHP (BLM 1987; BLM 2003). In their evaluation of impacts to cultural resources from reservoir operations, Alpine Archaeological Associates estimated that 40% of the sites within the upper 110 feet of the reservoir basin may be eligible to the NRHP (USBR 2003b). However, most sites within the reservoir area have not been officially evaluated to determine their NHPA eligibility.

Cultural resource sites within the reservoir area are varied. The 143 known sites within the reservoir drawdown zone range from prehistoric/protohistoric artifact scatters to historic house foundations with the most common types (about 40 percent) being Pueblo I and Pueblo II habitations, which typically contain masonry room blocks associated with pit structures. Additionally, cultural items protected under NAGPRA exist on many of these sites. The known sites within the reservoir drawdown zone have likely retained much of their integrity (especially pit features) but that integrity is presently being compromised to varying degrees due to wave action and exposure (Alpine, 2000). It is presumed that site density, type, and integrity of archaeological sites within the reservoir area, but outside of the reservoir drawdown zone is similar to that of sites within the drawdown zone.

Many cultural sites within the reservoir area and nearby have already been damaged by natural and human-related activities whether or not related to the reservoir. Such damage has been caused by natural actions, such as erosion and wildfire, and human actions such as settlement, agricultural and energy development, recreation use and development, and reservoir construction and operations. Even with the current cultural resources protection requirements for federal undertakings, similar damage will likely continue to occur, especially due to the increased human activity in the area. Therefore, Reclamation plans to develop, implement and maintain a programmatic cultural resources management plan (CRMP) to guide the long-term management of cultural resources within the reservoir area.

A CRMP is a comprehensive area-specific plan that details how cultural resources will be managed in accordance with applicable laws, regulations, policies, etc.. The CRMP details how all cultural resources on the reservoir area will be managed in accordance with applicable laws, regulations, policies, etc. It is a broad-brush, proactive plan that identifies protocols, needs, priorities, etc. to effectively manage cultural resources with respect to their significance and the expected use of the area. Concurrent with the development of the CRMP, certain baseline data concerning the means necessary to

either preserve sites or to mitigate impacts needs to be collected. In brief, the programmatic approach will include the following steps, some of which may run concurrent with others):

- 1) Develop CRMP- The plan guides the overall management of cultural resources within the reservoir area. It identifies known inventories, sites/eligibility, establishes priorities for additional inventory/evaluation; sets schedules for action items such as inventories, evaluations, and monitoring; and includes site specific treatment and mitigation plan development and implementation as attachments/action items, etc.
- 2) Inventory and Evaluation: This is a phased action item under the CRMP. Initiate and complete a cultural resources inventory and evaluation of the entire reservoir area in accordance with schedules, and priorities, etc. from the CRMP. This step would include the following activities: a) a literature search to tabulate known cultural resources above the high water line; b) an inventory of the entire typical reservoir drawdown zone (about the 6,040 foot elevation and above); c) an inventory of the reservoir area outside of the reservoir basin; d) Site Significance Evaluations, which determine each site's condition and eligibility to the NRHP; e) Assessments of Threat, which determine any eligible site's nature and immediacy of possible threats from management actions; and f) Rankings of Site Value, which assess site values with other sites identified in the inventory. Also included in this action would be an NRHP-eligibility evaluation of the Navajo Reservoir District and subsequent recommendation to the New Mexico and Colorado State Historic Preservation Officers. This involves compiling and synthesizing all of the existing cultural resources inventory and investigation data, and submitting eligibility documentation to the SHPOs for final determination.
- 3) Preservation Assessment: Determine a site-specific approach to decide on the most practical treatment for preservation and/or mitigation at a given site. This action to be in accordance with schedules, priorities, etc. from the CRMP.
- 4) Site Treatment Plan Preparation: Develop site-specific plans for the protection, mitigation, and management of specific historic/significant properties affected by reservoir area activities. It will focus on specific sites and the most appropriate treatment measures as a result of the previous steps. These plans would be developed in accordance with schedules, priorities etc. from the CRMP.
- 5) Implement Site Treatments: In this step, the site treatment plans for specific sites are implemented in accordance with schedules, priorities etc. from the CRMP.
- 6) Monitoring: This step consists of qualified archaeologists periodically monitoring all historic/significant sites in the reservoir area to ensure that treatment methods are effective. The monitoring will be in accordance with schedules, priorities etc. from the CRMP.

### **Indian Trust Assets**

The following tribes are known to have Indian Trust Assets associated with the Navajo Reservoir area:

- Navajo Nation
- Southern Ute Indian Tribe
- Jicarilla Apache Nation

These ITAs may include, but are not necessarily limited to, water rights, mineral rights, access rights, and hunting/fishing rights. A more detailed description of each tribe's ITAs follows.

### *Navajo Nation*

The Navajo Nation's ITAs include Navajo Indian Irrigation Project (NIIP) water allocations and water transportation facilities; and additional substantial, but not yet adjudicated, San Juan River water right claims (USBR 2002). Navajo Reservoir is the principal storage feature for the NIIP. Public Law 897-483, the NIIP authorizing act, identified a diversion amount sufficient to irrigate approximately 110,630 acres and defined that amount as an average annual diversion of 508,000 acre-feet (af). The 1976 agreement between Reclamation and the Navajo Nation provides for delivery of the 508,000 af/y from Navajo Reservoir through the main NIIP canal headworks at Navajo Dam. However, the NIIP was later reconfigured which reduced the estimated diversion requirement to about 337,500 af/y (USBR 2002). The actual amount of water to which the Navajo Nation is entitled for NIIP is yet to be decided (USBR 2003b).

### *Southern Ute Indian Tribe*

The Southern Ute Indian Tribe's ITAs include mineral rights, railroad right-of-way crossing privileges, and fishing rights. There are about 621 acres of former SUIT lands within the reservoir area on the Piedra and San Juan arms in Colorado (USBR 2000a). These lands are the remnants of about 707 acres transferred to the United States for the Navajo Dam and Reservoir Project by the Act of October 15, 1962 (P.L. 87-828) in exchange for other public lands. That Act also provided for the following:

- SUIT retained the mineral rights on these former tribal lands and the right to prospect for and remove said minerals from these former tribal lands in a manner that does not impair the project, as prescribed by the Secretary of the Interior (SOI).
- The Southern Ute Indians were to be granted privileges to cross any railroad right-of-way granted by the US over these former tribal lands at such points as the SOI determines to be reasonable.
- These former tribal lands are not to be utilized for public recreation facilities without the approval of the Southern Ute Tribal Council.
- Nothing in the Act is to be construed to abridge any fishing rights that are vested in the Indians.
- These former tribal lands have the status of public lands withdrawn for administration pursuant to federal reclamation laws and are subject to all laws and regulations governing the use and disposition of public lands in that status.

### *Jicarilla Apache Nation (JAN)*

The Jicarilla Apache Nation's ITAs associated with Navajo Reservoir consist of water rights. Public Law 102-441 made available to the Jicarilla Apache Nation a 40,000 acre-foot/year diversion under federal water rights for the Navajo Reservoir and the San Juan-Chama Project. Of this amount, up to 33,500 acre-feet/year (25,500 af/y depletion) was to come from the Navajo Reservoir Supply (including the Navajo River on the Reservation); the remaining 6,500 acre-feet/year was to come from the San Juan/Chama Project. If the Jicarilla Apache Nation cannot utilize its full water entitlement it may market the unused portion. (Public Law 102-441)



The Jicarilla Apache Nation has marketed some of its water entitlement from the reservoir supply (See Appendix C). Current contracts for Jicarilla water include, but are not necessarily limited to:

- 16,200 acre-feet/year (af/y) to Public Service Co. of New Mexico (PNM)
- 840 af/y to small contractors (Giant Refinery, San Juan Water Haulers, and individual irrigators)

### **Paleontological Resources**

Reclamation has not inventoried or evaluated paleontological resources within the reservoir area. While the San Juan Basin is known to be an important area for dinosaur, mammalian and reptilian fossils and many varieties of fossils are found in the Triassic, Jurassic, Cretaceous and Tertiary rocks, BLM did not identify any significant fossil locations in close proximity to the reservoir. The nearest BLM paleontological SMAs are from about 9 to 15 miles from the reservoir area (BLM 2003a). The BLM has designated the San Jose Formation as Class I-B at a site just north of the reservoir area. Class I-B areas have high potential for scientifically significant fossils and the BLM recommends detailed site field checking within such areas prior to any surface disturbance (USBR 1999).

## **RECREATION AND VISUAL RESOURCES**

### **Recreation**

#### *General*

While there are a variety of recreation opportunities available in the general area of the reservoir, visitor surveys conducted by the Farmington (NM) Convention and Visitor Bureau indicate that Navajo Lake [Reservoir] is the most popular visitor destination in the area (BLM, 2003a). Two state parks at the reservoir provide flat-water, stream and land-based recreational opportunities in both developed and undeveloped settings.

NMSPD manages about 32,500 acres of the reservoir area in NM as Navajo Lake State Park (NLSP). CDPOR manages about 5,500 acres in CO as Navajo State Park (NSP). Each state manages recreation in accordance with their respective laws and regulations, as well as applicable Federal laws and regulations. The parks are generally open year-round with seasonal closures in some areas to conserve natural and park resources. The recreational management of NLSP (NM) is severely limited by the logistics of the area, including, minimal staff and budget, limited and/or time consuming vehicular or boat access, and the need to drive into Colorado for vehicular access to Miller Mesa and Middle Mesa.

There is no requirement to retain reservoir water above the inactive pool for recreational purposes. The inactive capacity of the reservoir was identified for creation of power head, fish and wildlife propagation, recreation, and other purposes (USBR, 1950). While the active capacity of the reservoir, from elevation 5990 feet to 6085 feet, is available for recreational use, the minimum useable recreational pool for the Colorado portion of the reservoir is about 6005 feet.

Both New Mexico and Colorado supply the necessary water for consumptive recreational use at the developed recreation areas. In New Mexico, potable water and water for landscaping is supplied by intake structures in the reservoir and in the river below the dam, treatment plants and storage tanks. In Colorado, potable water is supplied by a well

and storage tank, and water for landscaping is supplied by irrigation return flows and natural runoff stored in ponds. Reclamation was to reserve to the United States 400 acre-feet per year of reservoir water for consumptive use at reservoir recreation sites (USBR 1964).

#### *Developed Recreation Sites*

Developed public recreational facilities at Navajo are provided at Arboles (CO), Pine River (NM), Sims Mesa (NM), and the San Juan River (NM) below the dam. These facilities include visitor centers, marinas, boat launch ramps, campgrounds, picnic areas and hiking trails. For a more detailed description of developed facilities see Appendix G. The recreation facilities in Colorado were recently rehabilitated under a joint agreement between CDPOR and Reclamation. Some of the facilities in New Mexico have been rehabilitated under joint agreement between NMSPD and Reclamation, however, many of the facilities in New Mexico are old and in need of replacement or rehabilitation. NMSPD has plans to complete rehabilitation of its recreational facilities with potential cost sharing from Reclamation (NMSPD 2002).



**Figure 3-4: Marina at Pine Recreation Site (NM); Photo by Alan Schroeder, August 2004.**

Concessions may provide certain recreation-related facilities and services at both state parks. CDPOR recently assumed marina operations at Navajo State Park due to the expiration of its concession contract with San Juan Marina and an unsuccessful solicitation for a new concession operation. The State of Colorado is planning to rebuild and operate the marina by the 2005 summer season. NMSPD currently has two concessionaires: Sims Mesa Marina at Sims Mesa, and Navajo Dam Enterprises at Pine River; these concessions provide marinas and other services such as boat rental, storage and repair, and gas and groceries. A third NMSPD concession for recreation management at the Miller Mesa area expired January 1, 2004 and was not renewed; NMSPD subsequently closed that area to vehicular access due to resource protection and administrative considerations. NMSPD also issues permits for commercial fishing guide services on the San Juan River below the dam.

#### *Undeveloped Remote Recreation*

The reservoir area is generally open to dispersed recreational activities outside of the developed areas, although various restrictions on use or access may be in place. Several

remote areas around the reservoir receive heavy, concentrated day and/or overnight use. These remote, high-use areas are popular for several reasons, including: fewer people, easy access, sheltered camping with good shoreline, limited regulation, minimal or no use fees, limited law enforcement, and a more primitive setting. Some of the more popular and heavily used remote sites include:

- Sambrito/Miller Mesa (NM)- walk-in and boat access only
- Arboles Point (CO)- vehicle and boat access
- Frances Arm [Cove] (NM)- particularly the east end and Skinny Dip Cove; vehicle and boat access.
- Colorado Cove (NM)- vehicle and boat access
- La Jara Canyon (NM)- mostly houseboat and boat-in shoreline camping and fishing
- Shoreline west of Dick Earl Canyon (NM)- vehicle and boat access; heavy use
- Negro Andy Canyon (NM)- receives moderate to heavy use.
- Dick Earl Canyon (NM)-
- Bancos Canyon (NM)- heavy use by boaters from Colorado

Both state park divisions are implementing restrictions supported or approved by USBR for such remote use sites to protect other resources from excessive damage and to better utilize limited park resources. Such restrictions include, but are not limited to, designating use areas, limiting vehicular access, implementing seasonal and/or long-term closures, charging use fees, etc..



**Figure 3-5: Pinyon-Juniper Woodland with Adjacent Remote Recreational Use Site (NM):**  
**Photos by Alan Schroeder, August 2004.**

## Recreational Use and Visitation

### *General*

The Navajo Reservoir area is a popular primary recreational destination (USBR 1999; BLM 2003a) and provides opportunities for both land-based and water-based recreation. In 1995, EDAW, Inc. listed the seven most popular recreational activities at the reservoir area, as identified in a survey of reservoir area users; in descending order, these activities were fishing, swimming, picnicking, pleasure boating, hiking/walking, water skiing, and wildlife/nature observation. Other popular recreational activities include camping, hunting, non-motorized boating, scuba diving, personal water craft (PWC) use, horse-back riding, and mountain biking.

### *Fishing*

Fishing is the most popular recreational activity identified for the reservoir area. Fishing patterns on the reservoir are largely boat fishing, since shoreline access is limited, particularly in New Mexico. Fishing patterns on the San Juan River below the dam include drift boating, wading, and shoreline fishing. Important fishing areas depend upon the time of year and species sought. The respective state game and fish divisions regulate fishing within the reservoir area in accordance with their laws and regulations.

Species sought in the reservoir area include rainbow and brown trout, kokanee salmon, smallmouth bass, crappie, bluegill, and catfish. The San Juan River just below the dam is a world-renowned trout fishery, with rainbow and brown trout eagerly sought by fishermen from around the world. The San Juan and Piedra rivers at the upper end of the reservoir are both popular trout fisheries. (USBR 1999).



**Figure 3-6: Trout fishermen on the San Juan River Quality Trout Waters; (photo provided by Steve Mueller (NMSPD)), 2004.**

Both Colorado and New Mexico currently have advisories regarding consumption of fish from Navajo Reservoir and the San Juan River due to mercury concentrations. Colorado's advisory applies to the San Juan and Piedra arms of the reservoir. New

Mexico's advisory applies to both Navajo Reservoir and the San Juan River below the Hammond Diversion. The advisories generally recommend restricting fish consumption, but may also include no consumption of fish, from these waters, particularly for persons at risk (e.g., pregnant and nursing women, women planning to become pregnant, and children). These recommendations are based on size and species of fish. Generally, the recommendations are more restrictive for larger fish due to the bio-accumulative nature of mercury in the food chain. For more details on these advisories you can contact the respective state departments of health and/or environment or the Environmental Protection Agency. (EPA 2004)

### *Swimming*

While swimming was identified as a major recreational use of the reservoir area, there are no designated swim beaches at the reservoir. Swimming in Navajo Lake State Park (NM) is at the swimmers own risk. Within Navajo State Park (CO), swimming is allowed only at designated swim beaches and since there are no designated beaches, swimmers in Colorado may be ticketed and fined. Incidental swimming associated with activities such as water skiing and scuba diving is allowed in both state parks.

### *Boating*

Boating was identified as a major recreational use of the reservoir area, and both states regulate boating within their respective portions of the reservoir area. The reservoir is open to both motorized and non-motorized vessels, including motor boats, house boats, sailboats, PWC, canoes and associated activities, including water skiing, etc.. No recreational boating is allowed on the first 1.5 mile of the San Juan River below the dam; beyond that, boating is restricted to non-motorized vessels and float fishing is popular (USBR 2003b). The vessels and their associated use are subject to various federal and/or state laws and regulation. For more detailed information regarding boating regulations within the Navajo Reservoir area, please contact the respective state parks division.

### *Hunting*

With some restrictions, the reservoir area is open to hunting, including big and small game, and waterfowl. The respective state game and fish divisions regulate hunting within the reservoir area in accordance with their laws and regulations. The state parks departments may restrict hunting within the State Parks to protect public safety.

### *Camping*

While camping was not identified as one of the more popular recreational activities, it is often associated with or supports other activities. Camping takes place in both developed areas and remote undeveloped areas. Methods of access to the remote sites for camping purposes include boat-in, vehicular, and walk-in opportunities. Camping is regulated by the respective State Parks through their laws and regulations.

### *ORV Use*

The reservoir area is currently closed to recreational ORV use pursuant to Reclamation and state rules or regulations. However, ORV use associated with a valid existing right may be allowed. Any authorized ORV use is subject to applicable federal and/or state laws and regulations. Some unauthorized ORV use occurs within the reservoir area because of differing rules on adjacent lands and the lack of signs identifying administrative boundary changes and associated regulatory changes. (Note- Throughout

this document, the term “off-road vehicle and its acronym, “ORV” will be used and is considered synonymous with and inclusive of the terms “off-highway vehicle (OHV)” and “off-highway motorized vehicle,” as defined by the state of Colorado and the State of New Mexico, respectively. See glossary.)

### *Visitation*

Recent recreational visitation data for the State Parks are shown in Table 3-7. Although there is some variability in growth rates, the data shows a general upward trend. It should be noted that the numbers in the table may not include visitors to undeveloped areas of the reservoir. Informal visitor counts in 1995, suggested that there were about 40,000 - 50,000 visitors to undeveloped areas that year (USBR 1999).

Navajo Lake State Park (NM) accounts for the majority of the visitation to the reservoir area, with about 70 percent to 30 percent at Navajo State Park (CO). While recreational visitation to the reservoir area has varied somewhat over the last 13 years, there was a net increase in visitation of about 63 percent for Navajo Lake State Park and about 24.5 percent for Navajo State Park with corresponding average annual growth rates of about 4.8 and 1.9 percent, respectively. The general upward trend for visitation at Navajo is expected to continue due to the expected regional population growth. The reduced visitation rates in 2003 can probably be attributed, in part, to low water levels due to prolonged drought conditions.

Visitation surveys conducted by EDAW in 1995 addressed visitor perceptions on crowding. About 34% of the respondents felt that the reservoir is often crowded and about 52% felt that it is sometimes crowded. Somewhat different results were obtained for the San Juan River below the dam. There, about 72% of the respondents felt the river was moderately to extremely crowded, and 43% of the respondents indicated that they had to pass up good fishing water 50% or more of the time because another angler was already there (USBR 1999).

**Table 3-7: Annual Visitation, Navajo Reservoir**

	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2003</b>
<b>Colorado</b>	146,117	203,339	258,073	182,000
<b>New Mexico</b>	323,277	451,409	536,249	527, 747
<b>TOTAL</b>	469,394	654,748	794,322	709,747

### **Visual Resources**

The combination of water, rimrock canyons and mountain backdrop makes the reservoir area a scenic and valuable regional resource. The reservoir and the surrounding lands are characterized by sloping rocky plateaus broken by small washes, large arid canyons, and large rivers. The rivers, for the most part, have cut deeply into the surrounding mountain and plateau lands to create substantial valleys and escarpments adjacent to the reservoir. Along the rivers there are stands of riparian woodland vegetation. On the uplands a mixture of sage, pinyon-juniper and rock outcrops generally dominates the view. West of



the confluence of the Piedra and San Juan rivers the lands are relatively flat and agriculture use is dominant.

While the majority of the lands within a mile of the reservoir may appear natural to the casual observer, there are many landscape modifications present, particularly oil/gas development facilities. Other visual modifications include the developed recreation areas, the dam and associated facilities, highways, the town of Arboles, CO, and the Navajo Dam community (NM). Depending on the viewing location these modifications may be highly visible, hardly noticeable, or somewhere in between.

Visibility within the reservoir area, particularly from the reservoir surface, is generally confined to the foreground or the near middle-ground due to the woodland vegetation and the vertical relief of the area. In the Arboles area, the gentler terrain and more open vegetation provides for extended visibility to the northwest. Panoramic views of the area may be seen from various points including: Arboles Recreation Site, NM Highway 511 north of the dam, the dam, Pine River Recreation area, DeLasso Loos Road near the dam, Smith Pass south of the reservoir, and from canyon rims throughout the area.

Reclamation has not classified the visual resources of the reservoir area; however, BLM's Visual Resource Management (VRM) classification can serve as a general guide to visual resources at the reservoir. The FFO classified BLM lands around the reservoir as VRM Class II because of the expanse of water and the impressive views; contiguous USBR lands in New Mexico generally have similar values. (BLM 2003a). The FFO designated its land beyond the influence of the reservoir as VRM Class IV (BLM 2003a). Table 3-8 shows BLM's VRM classes and their management objective.

**Table 3-8: BLM Visual Resource Classifications and Management**

**Guidelines**

Class	Relative Value	Management
I	Greatest	<ul style="list-style-type: none"> <li>Preserve the existing character of the landscape.</li> <li>Provides for natural/ecological changes.</li> <li>Does not preclude very limited management activity;</li> <li>Level of change should be very low and not attract attention.</li> </ul>
II	Greater	<ul style="list-style-type: none"> <li>Retain the existing character of the landscape.</li> <li>Level of change should be low; changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.</li> <li>Management activities may be seen, but should not attract the attention of the casual observer.</li> </ul>
III	Moderate	<ul style="list-style-type: none"> <li>Partially retain the existing character of the landscape.</li> <li>Level of change should be moderate; changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.</li> <li>Management activities may attract attention, but should not dominate the view of the casual observer.</li> </ul>
IV	Lower	<ul style="list-style-type: none"> <li>Provide for management activities that require major modification of the existing character of the landscape.</li> <li>Level of change can be high; however, the impact of activities should be minimized through careful location, minimal disturbance, and repeating the basic elements.</li> <li>Management activities may dominate the view and be the major focus of viewer attention.</li> </ul>

## LANDS AND LAND USE

### Ownership and Management Direction

#### *Bureau of Reclamation*

Reclamation obtained approximately 38,320 acres of land within the reservoir area for the construction and operation of the Navajo Unit. (See Map 1-2). Reclamation has the overall jurisdiction and responsibility for resource management and use within the reservoir area and uses contracts or agreements with other entities to provide some of that management. The lands and waters of the reservoir are maintained for project purposes and facilities, reservoir operations, developed and dispersed recreation, and fish and wildlife purposes. Additional uses, including oil/gas development, rights-of-way, and livestock grazing, may also occur within the reservoir area.

Reclamation has designated about 500 acres around the dam as its Primary Jurisdiction Area (PJA), as shown on Maps 2-1 and 2-2. The PJA encompasses the dam and appurtenant structures and is managed by Reclamation for reservoir operations. The PJA also includes the NIIP headworks and appurtenant structures which are managed by BIA in cooperation with Reclamation. While Reclamation allows some public use of the PJA, certain areas may be closed to such use for public safety or dam security reasons. The following is a partial list of public closures within the PJA:

- Within 200 feet of the intake works and the spillway channel inlet
- For 0.25 miles below the dam
- Parking lot by USBR office
- NIIP headworks and appurtenant structures
- General area delineated by signage

Reclamation operates the reservoir and project facilities to meet project purposes. Project facilities within the reservoir area include the dam and appurtenant features; the reservoir and the reservoir area lands; the USBR office/warehouse complex and appurtenant features; and the NIIP headworks, and delivery system and appurtenant features; and the project roads for access to these facilities.

Developed recreation areas are located at Arboles (CO), Pine River (NM), Sims Mesa (NM) and the San Juan River below the dam (NM). These areas occupy approximately 400 acres and provide many recreational opportunities, as discussed in the Recreation section.

The remainder of the reservoir area is classed as general project lands. With few exceptions, these lands have no formal management designation or defined management emphasis and have had minimal management over the years. These lands may be utilized for project purposes, dispersed recreational use, fish and wildlife management, oil and gas development, livestock grazing.

As part of the management of the reservoir area, some special management areas within and adjacent to the reservoir area have been designated by Reclamation and/or its managing entity. A summary of these areas is given in Table 3-9.



**Table 3-9: Special Management Areas, Navajo Reservoir and Vicinity**

Area	Manager	Acres	Management Direction
Primary Jurisdiction Area (NM)	USBR	500	<ul style="list-style-type: none"> <li>▪ USBR and BIA (NIIP) project facilities operations and maintenance</li> </ul>
Pine River Wetland Mitigation Site (NM)	USBR	38	<ul style="list-style-type: none"> <li>▪ Wetland/riparian mitigation (Hammond Salinity Control Project)</li> <li>▪ Limited, pedestrian, day use recreation</li> <li>▪ No grazing</li> </ul>
Sambrito Creek Wildlife Area (CO)	CDPOR	520	<ul style="list-style-type: none"> <li>▪ Wetlands and wildlife</li> <li>▪ Environmental Education</li> <li>▪ No grazing</li> </ul>
Arboles Recreation Site (CO)	CDPOR	165	<ul style="list-style-type: none"> <li>▪ Intensive, developed recreation</li> <li>▪ No grazing</li> </ul>
Pine River Recreation Site (NM)	NMSPD	220	<ul style="list-style-type: none"> <li>▪ Intensive, developed recreation</li> <li>▪ No grazing</li> </ul>
Sims Mesa Recreation Site (NM)	NMSPD	110	<ul style="list-style-type: none"> <li>▪ Intensive, developed recreation</li> <li>▪ No grazing</li> </ul>
San Juan River Recreation Area (NM)	NMSPD	780	<ul style="list-style-type: none"> <li>▪ Moderate developed recreation</li> <li>▪ "Quality trout waters," and stream fishing access</li> <li>▪ No grazing</li> </ul>
Old Government Camp (NM)	NMSPD	50	<ul style="list-style-type: none"> <li>▪ Recreation administrative site</li> </ul>
Sambrito/Miller Mesa (NM)	NMSPD	3,600	<ul style="list-style-type: none"> <li>▪ Upland wildlife, including bald eagles</li> <li>▪ Dispersed, primitive recreation</li> <li>▪ Walk-in, boat-in access only</li> </ul>
Middle Mesa Wildlife Area (NM)	BLM	46,052	<ul style="list-style-type: none"> <li>▪ Preserve/protect wildlife and their habitat</li> <li>▪ Limitations imposed on use and development.</li> </ul>
Reese Canyon RNA (NM)	BLM	2,344	<ul style="list-style-type: none"> <li>▪ Protect habitat for sensitive plant species and bald eagles</li> <li>▪ Limitations imposed on use and development.</li> </ul>
Negro Canyon Scenic Area (NM)	BLM	1,992	<ul style="list-style-type: none"> <li>▪ Protect natural values</li> <li>▪ Provide for semi-primitive non-motorized recreation</li> <li>▪ Strict limitations imposed on use and development</li> </ul>
Rattlesnake Canyon Wildlife Area (NM)	BLM	110,160	<ul style="list-style-type: none"> <li>▪ Manage to support potential increases in wild-life</li> <li>▪ Limitations imposed on use and development.</li> </ul>
Simon Canyon Recreation Area/ACEC (NM)	BLM	3,982	<ul style="list-style-type: none"> <li>▪ Provide diverse public recreational activities</li> <li>▪ Protect cultural and natural resources.</li> <li>▪ Limitations imposed on use and development.</li> <li>▪ Includes Simon Ruin ACEC</li> </ul>
Navajo Lake Horse Trails (NM)	BLM	6,752	<ul style="list-style-type: none"> <li>▪ Equestrian use on designated roads/trails</li> <li>▪ Limitations imposed on use and development.</li> </ul>
Bald Eagle ACEC (NM)	BLM	4,141	<ul style="list-style-type: none"> <li>▪ Protection of wintering bald eagles and eagle winter habitat</li> <li>▪ Mostly on BLM and USBR lands</li> <li>▪ Limitations imposed on use and development.</li> </ul>
Rosa Mesa Wildlife Area (NM)	BLM	69,762	<ul style="list-style-type: none"> <li>▪ Protect and preserve wildlife habitat</li> <li>▪ Limitations imposed on use and development.</li> </ul>
River Tract ACEC	BLM		<ul style="list-style-type: none"> <li>▪ Protect and rehabilitate the riparian and</li> </ul>

Area	Manager	Acres	Management Direction
			<p>wetland habitats consistent with the Riparian and Aquatic Habitat Management Plan of 2000.</p> <ul style="list-style-type: none"> <li>▪ Includes 17 tracts along the San Juan River within the FFO</li> <li>▪ Limitations imposed on use and development.</li> </ul>
Carracas Mesa Recreation/Wildlife Area (NM)	BLM	8,616	<ul style="list-style-type: none"> <li>▪ Protect and enhance wildlife habitat</li> <li>▪ Dispersed recreation- secondary emphasis</li> <li>▪ Limitations imposed on use and development.</li> </ul>

### *Bureau of Land Management*

The majority of the reservoir area in New Mexico is bounded by public lands managed by BLM (See Map 1-2). The Farmington Field Office (FFO) manages these lands for multiple uses, including oil and gas development, livestock grazing, wildlife, and recreation. BLM's management of lands and resources is guided by an RMP that was updated in 2003 and other resource or site-specific management plans such as Allotment Management Plans, Habitat Management Plans, etc. For a more detailed description of BLM's management refer to the FFO RMP and ROD.

The FFO currently manages federal minerals and livestock grazing within the New Mexico portion of the reservoir area under agreements with Reclamation. These agreements include a 1990 agreement for livestock grazing, a 1983 interagency agreement, and a 1967 agreement for minerals management. This management is in accordance with these agreements, the FFO RMP, and other BLM regulations, policies and guidelines appurtenant to those resources and uses.

As part of the management of its lands, BLM has designated several special management areas adjacent to the reservoir area (BLM, 2003c, RMP/ROD). Refer to Map 2-1 or 2-2 for the location of some of these SMAs. The Rattlesnake Canyon, Middle Mesa and Rosa Wildlife areas are not shown on the maps, but generally surround the reservoir area. A brief summary of these areas is given in Table 3-9. A more detailed description of these areas and their management direction may be found in Appendix N of the 2003 Farmington Proposed RMP/FEIS.

### *New Mexico*

#### **- New Mexico State Parks Division**

The New Mexico State Parks Division (NMSPD) manages the reservoir area within New Mexico as Navajo Lake State Park. That management is in accordance with a 1972 contract with Reclamation and appropriate Federal and State laws and regulations. Reclamation and NMSPD have begun negotiations for a new management agreement. In 2003, NMSPD developed a General Management plan for Navajo Lake State Park. That plan included coordination of management and development with Reclamation (NMSPD 2003). NMSPD has several special management areas within the reservoir area (see Table 3-8); these areas include the Sambrito/Miller Mesa area, the Pine River Recreation Area, the Sims Mesa Recreation Area and the San Juan River Recreation Area, and the old Government Camp area.

**- New Mexico Department of Game and Fish**

The New Mexico Department of Game and Fish (NMDGF) manages about 4,100 acres of state wildlife lands in close proximity to the reservoir area. These lands include about 4,000 acres acquired by the United States and transferred to NMDGF as upland wildlife mitigation for Navajo Reservoir. These original mitigation lands consist of several irregular, non-contiguous parcels on Burnt Mesa and between Laguna Seca Draw and La Jara Canyon. These lands are generally unfenced and are managed similar to the adjacent public lands.

NMDGF has also acquired fishing easements and/or private property outside the reservoir area on the San Juan River below the dam and on the Los Pinos River near the Colorado-New Mexico border.

**- New Mexico State Land Office**

The New Mexico State Land Office administers more than 17,000 acres in the vicinity of Navajo Reservoir. The primary purpose of these lands is to generate revenue for schools and land grant colleges. The Land Office leases surface and mineral rights as well as rights-of-ways and distributes the proceeds to designated beneficiaries. Ninety-five percent (95%) of these state lands is leased for grazing.

***Colorado***

**Colorado Division of Parks and Outdoor Recreation**

The Colorado Division of Parks and Outdoor Recreation (CDPOR) manages the reservoir area within Colorado as Navajo State Park. That management is in accordance with a 1994 contract with Reclamation and appropriate Federal and State laws and regulations.

**- Colorado Division of Wildlife**

The Colorado Division of Wildlife (CDOW) manages fish and wildlife resources within the Colorado portion of the reservoir area (Navajo State Park) pursuant to its statutory authority.

***Southern Ute Indian Tribe***

The Colorado portion of the reservoir area lies within the boundaries of the Southern Ute Indian Reservation. Southern Ute Indian Tribe (SUIT) lands adjoin the reservoir area along portions of the upper Piedra and San Juan arms. These tribal lands are minimally developed and are managed to sustain wildlife. The tribal natural resources management plan (1990) discusses plans for lands adjacent to County Road 500 and identifies the need for coordination with Reclamation. The tribe is considering designating Archuleta County Road 500 (SU 169) as a scenic byway, which could lead to recreational and low intensity commercial development on tribal lands along the San Juan arm (Olguin 1996).

There are about 621 acres of former SUIT lands within the reservoir area along the San Juan and Piedra arms in Colorado. The US acquired these lands for the Navajo Unit through exchange. These lands are subject to various rights reserved to the SUIT. Refer to the ITA section and Appendix C for a more detailed description of these reserved rights.

***Private Land (Both States)***

Private lands abut much of the reservoir boundary in both states. The majority of these lands remain in ranching or agriculture, but some have been developed for residential uses with lots ranging in size from less than one acre to 40 acres. Residential subdivisions adjoin the reservoir boundary at Arboles (CO), along the Frances Arm (NM) and at the northeast end of Miller Mesa. There are also several parcels of commercial land. Commercial and other uses are adjacent to project lands along the San Juan River.

The respective State and County laws and regulations control development of the private lands around the reservoir area. San Juan and Rio Arriba counties (NM) and La Plata and Archuleta counties (CO) have experienced substantial population growth in the past several years. That growth is expected to continue for the foreseeable future.

**Valid Existing Rights**

Numerous valid third-party rights exist throughout the reservoir area. Some of these rights existed prior to Reclamation's acquisition of lands and land interests; others were reserved at the time of Reclamation's acquisition, and still others have been granted or authorized by legislative, judicial, and administrative means. These rights include, but are not limited to management agreements, concessions, water rights, ITAs, oil/gas leases, rights-of-way, livestock grazing, livestock watering, and livestock trailing. A more detailed summary of valid existing rights may be found in Appendix C. Valid existing rights and any conditions or terms associated with them can affect how those rights and/or the affected area may be managed.

**Land and Resource Use**

***Oil/Gas Development***

Natural gas exploration and production activities and the associated facilities are a predominant land use within and adjacent to the reservoir area and have been since the 1950's (see Map 3-4). Conventional gas extraction from the San Juan Basin began in the 1920's and became extensive by the 1950's. Production of coalbed methane from the Fruitland Formation first began in 1954, but dramatically increased following the passage of the Crude Oil Windfall Profits Tax Act in 1980 (USBR 1999); coalbed methane gas development has been a primary focus since then. For more detailed description of current oil/gas development in the vicinity of the reservoir, please refer to the 20002 SUIT EIS for oil and gas development on the SUIT reservation and the 2003 Farmington Proposed RMP/FEIS.

Management of the oil/gas development within and adjacent to the reservoir area is complicated by the various administrative jurisdictions present. However, that management is in accordance with applicable laws and regulations and includes various measures to protect other resources both on the surface and down hole. The respective state oil/gas conservation agencies (New Mexico Oil Conservation Division, NMOCD, and Colorado Oil and Gas Conservation Commission, COGCC) regulate the development of State and private leases and, to a degree, federal leases within their states. The BLM, in conjunction with the respective state regulatory agency and the surface managers, regulate federal and Indian leasing and lease development. The respective counties may also have land use plans or codes which address oil/gas development; La Plata and Archuleta counties have such plans or codes. As the federal surface administration

agency for the reservoir area, Reclamation has the responsibility to ensure that other land use and resources within its area of jurisdiction are adequately protected.

**Table 3-10: Well Spacing by State and Formation**

Formation	Spacing (Number of Wells per Section)	
	Colorado	New Mexico
Dakota	4	4
Fruitland	2	2
Mesa Verde	4	8
Pictured Cliffs	4	4

Approximately 1,140 gas wells have been developed within the reservoir area. The great majority of wells within the reservoir area are completed in either the Fruitland Formation (438) or the Mesa Verde Formation (507). (USBR, 1999) Current allowable well spacing by formation and State is shown in Table 3-10. The current total number of wells per square mile within the reservoir area in Colorado and New Mexico is 16 and 18, respectively.

To support the oil/gas development in the area there are numerous facilities, including roads, tank batteries, compressor sites, water disposal sites, water haul access sites, electrical transmission lines and pipelines. An extensive network of roads provides access to the well sites and other facilities. Tank batteries and other well facilities may be present at each well site (see Fig. 3-7) or may be centrally located for a lease or unit. An extensive pipeline network transports the natural gas from the wells to market; most of these pipelines are buried and are built along roads or other pipelines. Some pipelines cross under portions of the reservoir, in particular the upper Los Pinos, Frances, and La Jara arms.



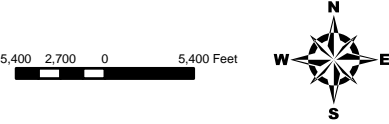
**Figure 3-7: Gas Well Location at Navajo Reservoir; USBR file photo 1983**



Map 3.4  
Oil / Gas Development  
Navajo Reservoir and Vicinity

- USBR Boundary
- Pipelines
- Dry Hole
- Gas Well
- Jinked & Abandoned
- Junked & Abandoned Oil
- Oil Well
- Plugged Gas
- Unclassified
- Cliffhouse
- Dakota
- Fruitland
- Gallup
- Graneros
- Mancos
- Menefee
- Mesa Verde
- Pictured Cliffs
- Point Lookup
- Undifferentiated
- State Highways
- County Roads
- Other Roads

The intent of this map is to provide a general idea of the level of oil/gas development within and adjacent to the Navajo Reservoir Area. This map was reproduced from one prepared by ED&W, Inc. in 1999 with data from BLM, and Blackwelder and Nichols. It is understood that facility data is not current or complete; facility locations are general and updated locations are needed.



"No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data, or for purposes not intended by USBR. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification."

Development of the natural gas requires water for drilling and other well operations. Much of this water is obtained from local sources including the rivers and the reservoir and hauled to the use site by truck. While most of this water use and hauling is authorized and/or legal, some of it may not be. USBR has authorized three access points for drafting water from the reservoir: Dick Earl Point, Negro Andy Point, and Eul Canyon.

Development of the coalbed methane in this area requires the disposal of large quantities of brine water produced during the gas extraction process. Methods for disposing of this produced water include direct use, evaporation pits, and underground injection wells. Methods to transport this water to a use or disposal site include truck haul and pipelines. For various economic and environmental reasons, underground injection is considered the best method for the disposal of large quantities of brine water. There are three injection wells within the general area but outside of the reservoir area: one is located west of the Pine River arm and north of the San Juan River; a second is located on Middle Mesa; and the third is on Sims Mesa. (USBR 1999) Because of the expense involved in transporting and disposing of the large quantities of produced water, there is a potential for illegal disposal to occur.

#### *Oil/Gas Development on the Reservoir Area*

The majority of the reservoir area, except the far north and northeast portions along the Piedra and San Juan arms, has had some oil/gas development (See Map 3-4). About half of the reservoir area in New Mexico is covered by federal oil/gas leases and the other half is covered by state or private leases; all are held by production. The Colorado portion of the reservoir area is underlain by private and SUIIT minerals and some development is currently occurring on private leases within the Colorado portion of the reservoir area. At this time the SUIIT has not expressed an interest in developing its oil/gas reserves within the reservoir area, however, in accordance with P.L. 87-828, SUIIT mineral development must be done in a manner that does not impair the Navajo Unit project. To the fullest extent possible, Reclamation requires and enforces reasonable measures to protect its interests, project purposes, and its resources during oil/gas development on its lands.

The FFO just revised its RMP, in part for oil/gas development, and the decisions related to oil/gas development also apply to the federal leases within the reservoir area in New Mexico (see the 2003 RMP and ROD (BLM 2003c) for details). Within the reservoir area in New Mexico, future federal leases will have a No Surface Occupancy stipulation. In addition, various Controlled Surface Use (CSU) and noise reduction requirements are applied to development on all federal leases to the fullest extent possible.

#### *Hydro-Electric Generation*

The City of Farmington owns and operates a hydro-electric generation plant immediately below the dam and within the PJA. The plant provides a portion of the electrical power that the City provides to northwest New Mexico. This plant is authorized through and operated in accordance with licenses from both the Federal Energy Regulatory Commission (FERC) and Reclamation. From 1989 to 1999, the plant has produced an average of 15.4 megawatts per year. In accordance with the license agreement between Reclamation and the City, the time and quantity of water releases and release changes from the dam is at the sole discretion of Reclamation. Under normal conditions, all reservoir dam releases less than 1,320 cfs flow through the plant's powerhouse to

generate electricity; dam releases in excess of that amount are released through the dam's main and/or auxiliary outlet works. (USBR 2003b)

### *Rights-of-Way*

There are numerous rights-of-way for roads, electrical transmission lines, gas pipelines, etc. within and adjacent to the reservoir area (See Map 3-4). Such rights-of-way are held by various governmental agencies, public utility companies, individuals, oil/gas operators, pipeline companies and other commercial entities. A partial listing and summary of such rights-of-way may be seen in Appendix C. Use and management of these rights-of-way are in accordance with appropriate laws, regulations, and specific terms and conditions that may be part of the authorizing document(s).

### *Transportation System*

The transportation system for the reservoir area and vicinity consists of several Federal and State highways, county roads, BLM and USBR roads, and oil/gas access roads (See Map 1-2). Several Federal and State and highways provide general vicinity access and some reservoir area access. These include, but are not necessarily limited to, the following:

- US 64 between Farmington, Bloomfield, and Dulce, NM runs generally east/west several miles south of the reservoir.
- US 550 between Durango, CO and Bloomfield, NM runs generally north/south, west of the reservoir
- US 160 between Durango and Pagosa Springs, CO- runs generally east/west, north of the reservoir
- CO 172 from US 160 to the New Mexico State line south of Ignacio, CO, then NM 511 from the state line south to Navajo Dam and then south to US 64
- CO 151 east of Ignacio, CO, through Arboles, CO at the northern end of the reservoir and then northeast to US 160
- NM 527 north from US 64 to Sims Mesa Recreation Area, Navajo Lake State Park, NM
- NM 539 northeast from Turley, NM on US 64 to NM 511 at Navajo Dam

County roads also supply both general vicinity access and reservoir area access. These include, but are not limited to, the following:

- Archuleta County (CO) Roads 500, 975, 982, and 988 provide direct access from Highway 151 to the northern end of the reservoir area.
- Archuleta County (CO) Roads 998, 977, and 475 provide general access between CO 151 and the Sambrito Creek/Miller Mesa area.
- La Plata County Roads 020, 326, 328, 330, and 332 provide general access between CO 172 and CO 151 to the New Mexico State line at the north end of the Middle Mesa area
- Rio Arriba County (NM) Roads 362, 511, and 570 provide general access to the area along the southeast side of the reservoir
- DeLasso Loos Road provides access from NM 539 to the area along the south side of the reservoir to NM 527 near the upper end of the Frances Arm.
- San Juan County (NM) Roads 4000, 4004, 4006, 4008, and 4012 provide general access to the Middle Mesa area.

A network of natural gas exploration and development roads provides both access to the general area from the highways and county roads and direct and indirect access to numerous remote points on the reservoir and/or within the reservoir area (BLM, 1996).



These access points include, but may not be limited to, Colorado Cove, Frances, Dick Earl Point, Negro Andy Point, Eul Canyon, La Jara Canyon, Laguna Seca Draw, Cottonwood Canyon, and various points on Middle Mesa.

Within the reservoir area, Reclamation and the respective state park divisions have constructed, and operate and maintain roads to meet project purpose and recreational needs. Recreational users may create additional unauthorized remote access to portions of the reservoir area and the reservoir through repeated cross country travel from a nearby road or well location.

### *Trails*

There are several formal trails and numerous informal trails within and adjacent to the reservoir area. Formal trails include, but are not limited to, the Navajo Lake Equestrian Trail, the Arboles Nature Trail, the Navajo State Park (CO) hike/bike trail, and the San Juan River Trail (NM). Informal trails are often created by repeated use by recreational users to get from one location to another. Many such informal trails provide the following:

- Access to/from and along a stream or the reservoir shoreline
- Access between developed facilities.

### *Livestock Use*

There is a mixture of livestock use within the reservoir area and the adjoining lands. The Colorado portion of the reservoir area is closed to livestock use, except for reserved livestock uses and associated incidental grazing. With some exceptions, the New Mexico portion of reservoir area is open to both reserved and permitted livestock use. The majority of the lands adjacent to the reservoir area are used for livestock grazing at the discretion of the landowners or a government land management agency.

There are about 23 reserved rights for ingress and egress over reservoir area lands for adjoining landowners to water their livestock at the reservoir or to trail their livestock across Reclamation lands. These rights, which often have minimal conditions on their use, were reserved by landowners at the time Reclamation purchased the land for the reservoir area. Reclamation works with the current holders of these rights to reduce the adverse effects associated with their use.

BLM administers 11 grazing allotments adjacent to the reservoir area in New Mexico. This administration is in accordance with BLM's regulations and requirements, any Allotment Management Plans (AMPs), and other activity management plans. Animals authorized for grazing on these allotments may include cattle, horses, sheep, and/or goats. Grazing may be allowed year-round or seasonally (BLM 1987).

BLM also administers livestock grazing within the New Mexico portion of the reservoir area pursuant to a 1990 agreement with Reclamation. Areas excluded from livestock grazing include: the developed recreation sites, the Miller Mesa wildlife/recreation site, the Pine River wetlands mitigation site, Reclamation lands along the San Juan River below the dam, and the Knowlton cactus recovery site. The agreement requires that administration of livestock grazing and development of range improvements be in accordance with applicable laws, in coordination with other resource values, and subject to some concurrence from USBR (USBR 1990, MOA 0-LM-48-00003). The reservoir

area lands subject to BLM grazing administration are included in some of the above mentioned allotments.

Unauthorized livestock use occurs repeatedly at several locations within the reservoir area. This unauthorized use is due to the lack of fences, incomplete fences, and poorly constructed or maintained fences. Areas with high incidences of livestock trespass include the Miller Mesa/Sambrito area, and the upper river arms. Reclamation is, on a case-by-case basis, working to resolve this unauthorized use.

Both Colorado and New Mexico are “fence out” states. In order to receive damages for livestock trespass on his property under state law, a landowner must construct and maintain a “lawful” fence. A lawful fence for Colorado is “a well-constructed three barbed wire fence with substantial posts set at a distance of approximately twenty feet apart, and sufficient to turn ordinary horses and cattle, with all gates equally as good as the fence, or any other fence of like efficiency” (Colorado Revised Statutes 35-46-101 (1)). A lawful barbed-wire fence for New Mexico, as described in NM Statute 77-16-4, is similar, but with four strands of wire and more specific standards for components, design and construction. Gates and cattle guards meeting the necessary standards are considered parts of a lawful fence. Fences other than barbed wire may also be considered legal fences if they meet the respective State’s requirements.

## **Socio-Economic Factors**

### *Industry*

The four counties surrounding Navajo Reservoir, San Juan and Rio Arriba counties in New Mexico, and La Plata and Archuleta counties in Colorado, are trying to create and maintain diverse and stable economies. Of the several economic factors that contribute to these counties’ well being, natural gas production, and recreation and tourism play important roles in their current economy. Agriculture generally plays a minor role in the area’s economics.

Because of the presence of the San Juan Basin Gas Field and coalbed methane in these counties, natural gas production either is or may become a major contributor to the economy of the four counties surrounding the reservoir and may be so for some time to come. For example, in 1997 San Juan County (NM) accounted for \$1.4 billion in gas production and in 2000 gas production from the FFO planning area accounted for \$3.8 billion (BLM 2003a). However, the gas production from the reservoir area is a very minor portion of the total economic contribution to the area from natural gas production.

Recreation and tourism is also a big contributor to the economies of these counties. Navajo Reservoir and the San Juan River just below the dam are two of the general area’s most popular recreational destinations. A 1996 NMSPD study found that Navajo Reservoir accounted for more than 300 jobs in San Juan County (NM) and contributed nearly \$6.6 million in direct recreational expenditures (USBR 1999). A CDPOR study in 1994 found that about \$20 per visitor was spent annually at or near State Parks, therefore, 100,000 visitors per year at a State Park could contribute about \$2 million annually to the local economy (USBR 1999). Out-of-state trout fishermen on the San Juan River below the dam currently provide about \$15.6 to \$18 million dollars annually to San Juan County’s economy (USBR 2003b).

Agriculture, including farming and livestock ranching, has become a minor economic factor in the area around Navajo Reservoir. For example, agriculture in Archuleta County (CO) accounts for less than 5 percent of gross receipts and about 0.5 percent of total retail sales (USBR 2003b). Agriculture in San Juan County (NM) is similar, accounting for about 4 percent of gross receipts and less than 1 percent of total retail sales (USBR 2003b). Water from Navajo Reservoir is used, in part, for agricultural irrigation and supports a portion of the agricultural sector in San Juan County, New Mexico. Livestock grazing of the reservoir area is a very minor part of the agricultural sector of the general area.

### *Annual Income/Unemployment*

The annual income and unemployment levels of the counties surrounding the reservoir are also an indication of the socio-economic status of the area. Table 3-11 compares the four counties with state and national levels of annual income and unemployment from the 2000 Census. The minorities within these counties are often at the lower levels for annual income and at the higher levels of unemployment.

**Table 3-11: Mean Annual Income and Unemployment Rates, 2000 Census**

	La Plata Cty. (CO)	Archuleta Cty. (CO)	San Juan Cty. (NM)	Rio Arriba Cty. (NM)	Colorado	New Mexico	United States
Per Capita Income, 1999	\$21,534	\$21,683	\$14,282	\$14,263	\$24,049	\$17,261	\$21,587
Household Income, 1999	\$40,159	\$37,901	\$33,762	\$29,429	\$47,203	\$34,138	\$41,994
Unemployment	4.0%	3.1%	5.5%	4.8%	3.0%	4.4%	3.7%

Source: 2000 Census; <http://factfinder.census.gov>

### *Population*

The four counties surrounding Navajo Reservoir have a population that is mostly white, but with a relatively high percentage of minorities, particularly Native Americans and Hispanics (See Table 3-12). The American Indian populations for these counties are higher than the national and state populations due to the presence of four Indian Reservations within these counties: the Navajo Nation, the Southern Ute Indian Tribe, the Jicarilla Apache Nation, and the Ute Mountain Ute Tribe. The very high Hispanic population in Rio Arriba County is likely due to how Hispanic ethnicity and race was addressed on the 2000 Census questionnaire.

**Table 3-12: Percentage of 2000 Population by Race/Origin**

Geographic Area	American Indian	Hispanic <sup>1</sup>	Asian	African American	White
United States	0.9	12.5	3.6	12.3	75.1
Colorado	1.0	17.1	2.2	3.8	82.8
La Plata County	5.8	10.4	0.4	0.3	87.3
Archuleta County	1.4	16.8	0.3	0.4	88.3
New Mexico	9.5	42.1	1.1	1.9	66.8
San Juan County	36.9	15.0	0.3	0.4	52.8
Rio Arriba County	13.9	72.9	0.1	0.3	56.6

<sup>1</sup> Hispanic- all races; a person of Hispanic ethnicity may be of any race

Source: 2000 Census; <http://factfinder.census.gov>

The area immediately adjacent to the reservoir area is sparsely populated. Small population centers close to the reservoir include the communities of Archuleta, Blanco, and Navajo Dam in New Mexico, and Arboles and Allison in Colorado. Larger population centers within about a two-hour drive of the reservoir include Farmington, Bloomfield, Aztec, and Dulce in New Mexico, and Durango, Bayfield, Cortez, Mancos, Dolores, Ignacio, and Pagosa Springs in Colorado.

*Minority/Low-Income Use of the Reservoir Area*

There is no known documentation of reservoir area use based on race, ethnicity, or income levels, so it is unknown to what extent minorities and low-income people actually use the reservoir area for recreation or to supplement their subsistence levels. Since the reservoir area is included in two state parks, the entry and use fees may limit such use. Use of the reservoir area by minorities and low-income persons may also be limited due to similar opportunities on other, more accessible, public or tribal lands within the general area that are closer to the population centers. Some minorities and low-income persons from nearby areas likely make limited use of the reservoir area for recreation, particularly day use, and to supplement their subsistence levels, particularly through fishing and possibly hunting. Such use of the reservoir area may be more likely to occur in areas with remote access because of reduced or no fees.